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Range Infrastructure Division (CSTE-TM)
US Army Test and Evaluation Command
2202 Aberdeen Boulevard
Aberdeen Proving Ground, MD 21005-5001

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DEPARTMENT OF DEFENSE

JOINT ORDNANCE TEST PROCEDURE (JOTP)-010

SAFETY AND SUITABILITY FOR SERVICE ASSESSMENT TESTING FOR SHOULDER LAUNCHED MUNITIONS

Joint Services Munition Safety Test Working Group

SAFETY AND SUITABILITY FOR SERVICE ASSESSMENT TESTING FOR SHOULDER LAUNCHED MUNITIONS

Joint Ordnance Test Procedure (JOTP)-010 8 January 2013
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Jose Gonzalez
Deputy Director, Land Warfare & Munitions
Office of the Under Secretary of Defense for
Acquisition, Technology and Logistics

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DEPARTMENT OF DEFENSE
JOINT ORDNANCE TEST PROCEDURE

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SAFETY AND SUITABILITY FOR SERVICE ASSESSMENT TESTING FOR SHOULDER LAUNCHED MUNITIONS

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This Joint Ordnance Test Procedure (JOTP) shall serve as the US Joint Services Safety and Suitability for Service Test Procedures with regards to Shoulder Fired Munitions until which time the Allied Ammunition Safety and Suitability for Service Assessment Test Procedure (AAS3P-10) is approved by NATO Allied Committee 326 (AC326). Upon approval of the Allied Publication (AP), thorough review of this document shall be conducted with the intent to supersede.

1. INTRODUCTION.

1.1 This Joint Ordnance Test Procedure (JOTP) is aimed at the Safety and Suitability for Service (S3) Assessment Testing for Shoulder Launched Munitions as agreed under Standard Agreement (STANAG) 4629 and Allied Ammunition Safety and Suitability for Service Publication (AAS3P)-1. AAS3P-1 provides general discussion of Safety and Suitability for Service Assessment Testing. AAS3P-10 is intended to act as a munition type specific document dealing specifically with the necessary safety testing and assessments for shoulder launched munitions to enter service within the North Atlantic Treaty Organization (NATO) community. Two S3 test approaches, analytical and empirical, are presented in this JOTP with the intent that the manager of the test program shall select the more appropriate approach for the munitions under test.

2. SCOPE.

2.1 Purpose.

2.1.1 The purpose of this JOTP is to guide personnel involved in the planning and implementation of S3 assessment testing of munitions to enable appropriate evidence to be collected covering the entire life cycle. The objective of the safety test program defined by this JOTP is to provide data to demonstrate that the munition will be “safe for use”, as defined in AAS3P-1, throughout the potential deployment possibilities in NATO service.

2.2 Application.

2.2.1 The guidance provided in this JOTP is applicable to NATO, multi-national collaborative and national acquisition of reloadable and non-reloadable shoulder launched munitions. The munitions covered by this JOTP include shoulder launched missiles, rockets, and projectiles as defined in Section 3 of this document.

2.3 Limitations.

2.3.1 This JOTP is not intended to be used in the assessment of effectiveness, reliability or performance of a munition unless failure to be reliable or to perform effectively is deemed to represent a direct and immediate safety hazard to the user or other personnel. However, the data may be used in the support of effectiveness, reliability, or performance assessment. This JOTP is not intended to address S3 for reloadable launchers.

3. DEFINITIONS.

3.1 Definitions in this JOTP take precedence over those in AAS3P-1, which in turn take precedence over those in Allied Ordnance Publication (AOP)-38.

3.2 Refer to AAS3P-1 for definitions related to Safety and Suitability for Service test procedures.

3.3 Projectile.

An object which is launched from a reloadable or non-reloadable launcher and projected by a force completely applied inside the launcher and continuing in motion by virtue of its own inertia. In the context of this document, a shoulder launched projectile is typified by the use of a recoilless launcher.

3.4 Rocket.

An unguided projectile which is launched from a reloadable or non-reloadable launcher and to which self-contained propulsive energy is applied during flight.

3.5 Missile.

A guided projectile which is launched from a reloadable or non-reloadable launcher and to which self-contained propulsive energy is applied during flight.

3.6 Reloadable.

Rocket, missile, or projectile including all propulsive, explosive, safe and arm, and initiation devices in a reusable launcher.

3.7 Non-Reloadable:

Rocket, missile, or projectile including all propulsive, explosive, safe and arm, and initiation devices in one single-use, disposable launcher. External sights, command launch units, and triggering devices may be attached to facilitate operation.

3.8 All-Up Round (AUR).

A munition containing all tactical components including, for example, live energetics, tactical electronics, safe-and-arm devices, etc.

3.9 Temperature Conditioning.

Exposure of a munition to a thermal environment in preparation for a test event at a specified test temperature.

3.10 Pre-Stress.

Exposure of a munition to a sequence of one or more environmental stresses (i.e. temperature, humidity, shock, vibration, etc.) prior to conducting a particular test event.

3.11 Solar Round Equivalent (SRE) Temperature.

The maximum temperature value experienced by the energetic material (e.g. motor propellant, warhead, fuze) during the solar test. Determination of this value will require exposure of an inert, internally instrumented munition, with similar thermal characteristics to the AUR, to the full solar test requirement defined in Annex C, Appendix 1, paragraph 5. The SRE temperature should be determined for the packaged and unpackaged state. In the absence of this data, a value of 71 ºC should be used for the SRE temperature.

3.12 Temperature Stabilization.

Temperature stabilization is achieved when the part of the item considered to have the longest thermal lag is changing no more than 2 ºC per hour. Since it may not be practical to monitor the part of a live munition with the longest thermal lag during test without damaging seals, the stabilization time may be determined prior to live munition testing using an inert, internally instrumented munition, with similar thermal characteristics to the All-Up Round. The stabilization time will typically be required for the munition in both the unpackaged and the transport configurations and at the hot and cold temperature extremes. In the absence of this data, a stabilization time of 12 hours may be applied as a default value for an individual unpackaged munition, 24 hours for an individual packaged munition, or 36 hours for palletized munitions.

3.13 Ready-to-Fire Configuration.

The ready-to-fire configuration is the final configuration of a munition immediately prior to firing. For a shoulder launched munition, this may include removal of an end cap, extension of the launch tube, or installation of an ancillary piece of hardware.

4. FACILITIES AND INSTRUMENTATION.

4.1 Facilities.

All test facilities utilized must suit specific test requirements and provide adequate protection for personnel and equipment in accordance with local and national regulations for testing of hazardous material. Note that although it is not necessary for all the facilities to be colocated, consideration should be given to the safe transport of potentially degraded test articles between test facilities. In addition to the requirements provided in Annex F, Table F-1, test facilities shall be prepared for the handling and possible disposal of explosive items.

4.2 Instrumentation Accuracy and Calibration.

The instruments and test equipment used to control or monitor the test parameters shall have an accuracy at least equal to 1/3 the tolerance of the variable to be measured. Recommended tolerances are provided in Annex F, Table F-2. In the event of conflict between this accuracy and guidelines for accuracy in any one of the test procedure or methods referenced in this document, the more stringent accuracy requirement takes precedence. The instrumentation and test equipment shall be calibrated periodically to laboratory standards whose calibration is traceable to national laboratory standards. The test facility shall maintain the calibration records.

5. LIFE CYCLE ENVIRONMENTAL PROFILE (LCEP).

5.1 Representative LCEPs for shoulder launched munitions are illustrated in Figures 1 and 2, and Annex B of this document as sequential test flow charts and munition allocation tables with test guidelines provided in Annex C and rationale provided in Annex A. The representative LCEPs are based upon the applicable environmental factors for storage, transportation, and deployment selected from Allied Environmental Conditions Test Publication (AECTP) 100, Annex A along with the generic usage profiles from AECTP 100, Annex E for a man portable munition. Testing in accordance with this life cycle sequence and combining environments (i.e., vibration with temperature) is required to determine if the interaction (synergistic effect) and/or the sequence in which environments are experienced may result in a safety hazard.

5.2 Deviations from these LCEPs contained in this document shall be approved by National S3 Authority(ies) or other appropriate authorities prior to the start of testing. The rationale used in tailoring shall be documented and retained as part of the Munition Safety Data Package as noted in Annex C of AOP-15.

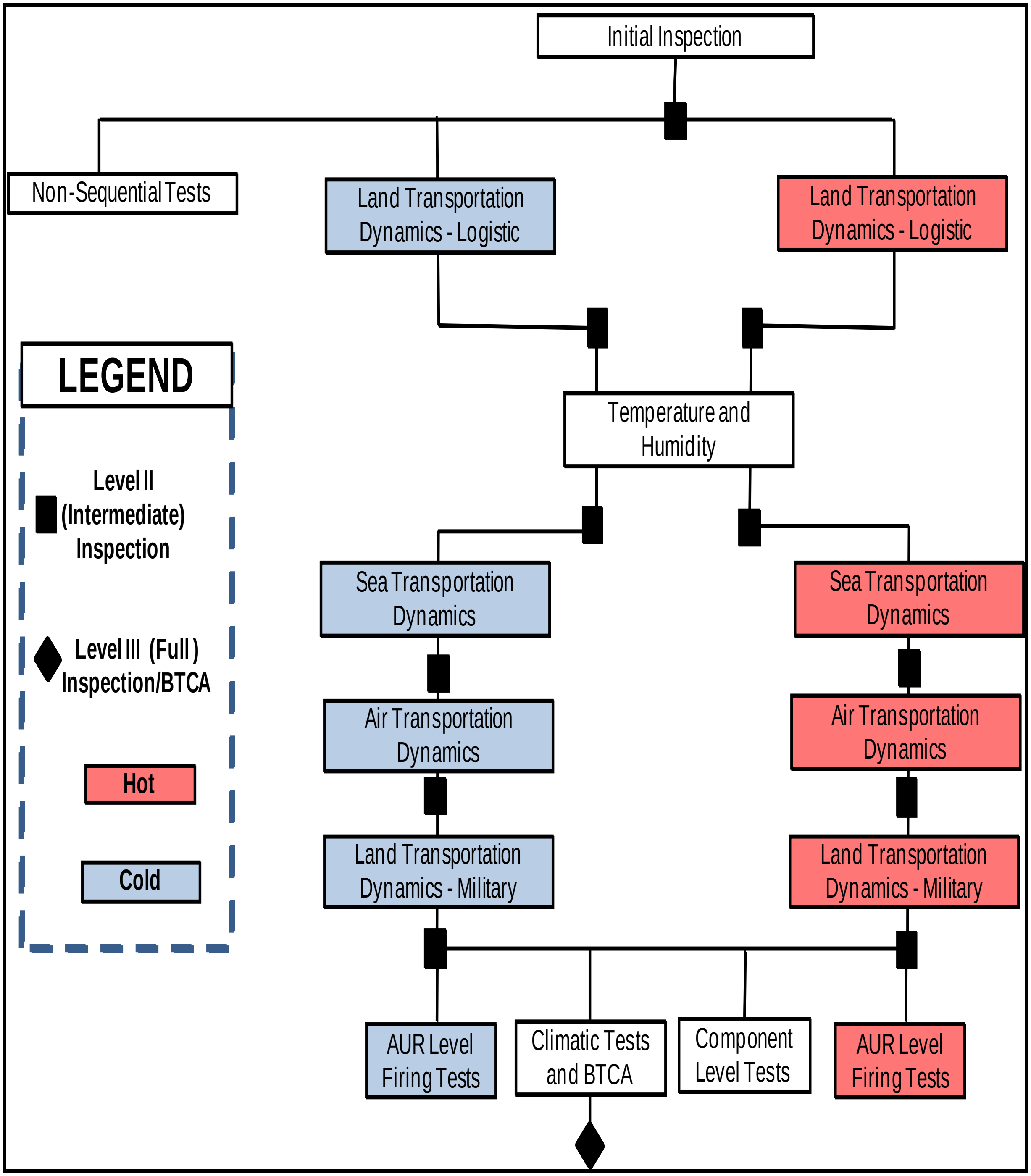

Figure 1. General test flow for shoulder launched munitions - analytical approach.

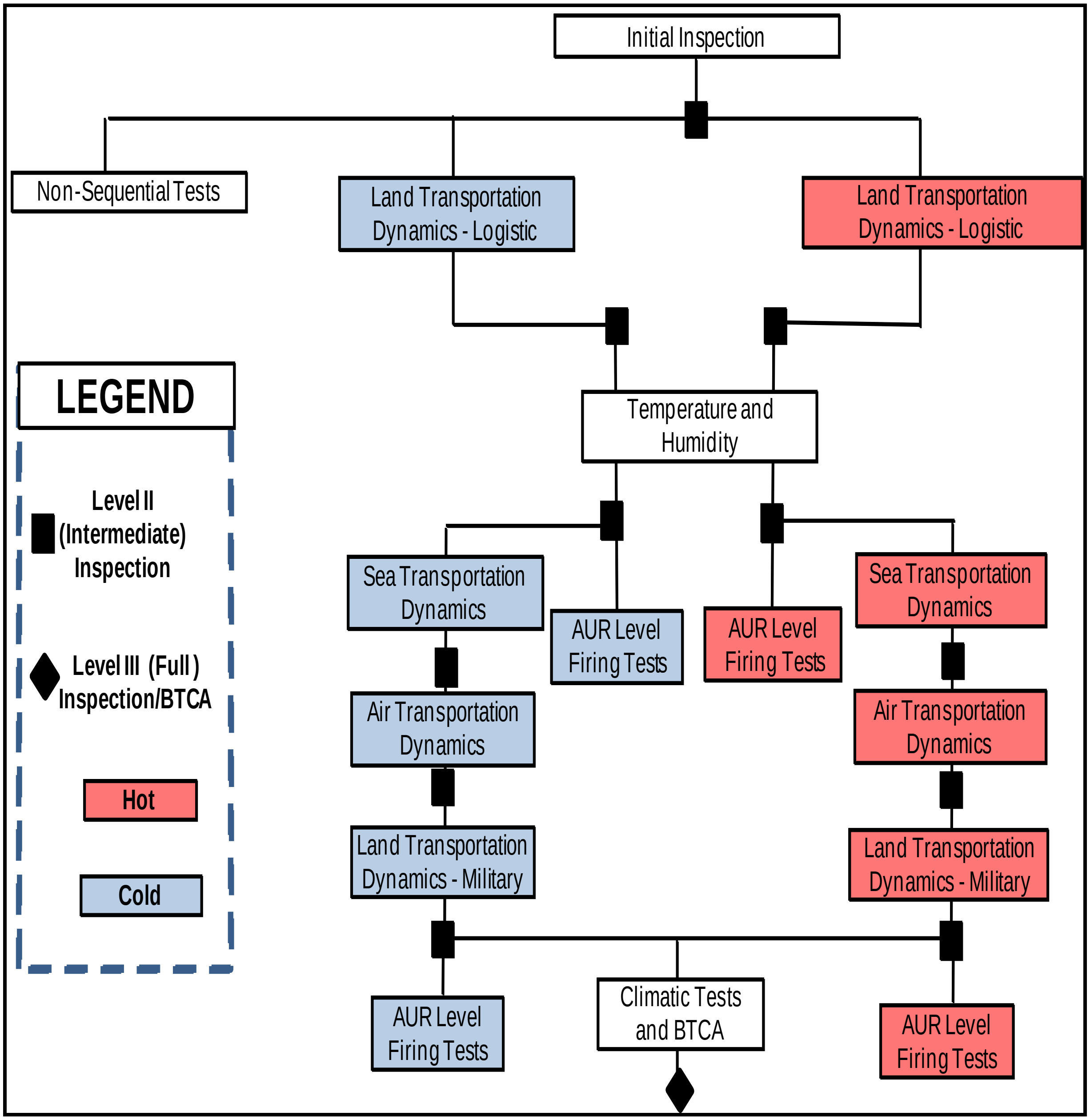

Figure 2. General test flow for shoulder launched munitions - empirical approach.

6. SAFETY TEST PLANNING.

6.1 Overall Test Objectives.

The objectives of the safety tests are to provide data to demonstrate that the munition is “safe for use” as defined in AAS3P-1. To achieve this, safety tests must provide data to determine:

a. Existence and nature of actual and potential munition hazards to personnel and equipment.

b. Safety of the munitions throughout the planned LCEP including storage, transport, maintenance, training, operations, firing, and disposal.

6.2 Data Sources.

Safety assessment of munitions is an evolutionary process, which begins in the early design phase of the munition and continues after deployment of the munition. The data gathered during the S3 tests described in this document should not be considered the exclusive source of data to support the safety assessment. Other sources of safety data such as the ones described below shall be considered.

6.2.1 Design and Test Data Review.

Review of existing safety, design and test data is recommended prior to development of the test plan in order to identify any potential hazards and their causes. Specifically this should include review of documentation relating to munitions requirements, design, safety, and any prior testing, including data from component and munition level performance and safety testing (engineering-design or component-development tests). The degree to which this JOTP is followed, and the degree to which other data are accepted in place of these JOTP tests, depend on the characteristics of the munition and on the credibility and completeness of existing safety data. These reviews and this JOTP must be used to develop the detailed test plan and shall be in accordance with the national health and safety standards and regulations. If the data review indicates a high probability of successfully passing a test, then the test procedures described in this document may be conducted. If the review indicates probable shortcomings in the munitions, or if component and munitions level performance test data are insufficient, then the procedures of this document should be expanded accordingly to validate the safety of the munitions.

6.2.2 Safety Assessment Report (SAR).

The SAR is a formal document that identifies potential test related hazards and mitigations which, in accordance with standardized procedures, shall be submitted by the munitions developer prior to commencement of testing. The SAR shall delineate the safety related characteristics of the munitions, identify potential hazards and assess severity and probability of the mishap risk of each identified hazard, and recommend procedures and precautions to mitigate hazards to an acceptable level of risk.

6.3 Test Tailoring.

The safety tests recommended in this document are intentionally conservative in nature in order to account for a wide range of potential deployment possibilities in NATO service. During sequential testing, test levels and/or test configurations may require tailoring such that non-safety hazard related damage in any one particular test does not affect the validity of subsequent test data. The rationale used in tailoring shall be documented and retained as part of the S3 assessment file. It should be noted that the elimination of tests, reduction of sample quantities, or reduction of severities may result in reduced evidence to fully support the required safety certification of the munition. Deviations from the S3 assessment testing program shall be approved by National S3 Authority(ies) or other appropriate Authorities prior to the start of testing.

6.4 Environmental Test Levels.

The environmental test levels specified in this document are based on the anticipated extreme conditions for storage, transportation, handling, maintenance, and firing of the munitions. Natural and induced environmental factors for storage, transportation, and deployment were selected from AECTP 100, Annex A. Climatic test levels are based upon climatic categories defined in AECTP 230 and 300; Dynamic test levels are based on AECTP 240 and 400; and Electromagnetic Environmental Effects (E3) test levels are based on AECTP 250 and 500. National test specifications may be employed to meet the environmental test requirements if it can be demonstrated that the national specification is technically equivalent or superior to the AECTP. Rationale for the specific test levels in this document is provided in Annex A. Test levels or specification deviations for munitions designated to be deployed to specific areas of the world or on specific transport or tactical vehicles may result in limitations on service use or require use of special procedures. Test time compression in accordance with AECTP 240 may be acceptable, however, the risk of introducing false failure modes should be considered.

6.5 Test Outline.

S3 assessment testing of shoulder launched munitions requires a series of sequential environmental tests, operating/firing tests, and non-sequential (stand alone) environmental tests. The test flow charts and munition allocation tables are shown in Annex B in this document. These include sequential and combined environmental tests (i.e., vibration with temperature) to determine if the interaction (synergistic effect) and/or the sequence in which environments are experienced may result in a safety hazard.

6.6 Test Safety Considerations.

Explosive materials often become less stable with age. This ageing is exacerbated by the presence of increased temperature, humidity and vibration/mechanical stressing. It is therefore necessary to review the projected test sequence and determine whether the sequence, including any temperature conditioning and storage, result in an unacceptable hazard. As a minimum, this will require an assessment of explosive material stability with respect to extreme temperature exposure durations. It might be necessary to divide the overall test time (shock, vibration & bounce in particular) into smaller portions to prevent heat build-up within the weapon and subsequent unintended energetic reaction. It is essential and mandatory to have a log for each weapon indicating the amount of time that has been spent at extreme temperature for the entire test sequence, including all periods of temperature conditioning.

6.7 Test Sample Quantities.

6.7.1 The test sample quantities are largely dictated by the minimum number of destructive tests (i.e. static firing, dynamic firings, breakdown test and critical analysis (BTCA), pressure vessel, hazard classification, and insensitive munitions) to provide sufficient evidence of munition safety. Specific rationale for the quantities in each of the destructive test categories is provided in Annex A. The following general notes should be considered when assessing the test sample quantities required for an S3 test program:

a. Materiel having more than one configuration or operating state may require increased test sample quantities.

b. Existing safety data may also be reviewed for acceptability with the goal of reducing sample sizes and the number of tests. The degree to which this data can be used depends upon munition characteristics, reliability and completeness of the existing safety data, and the adequacy with which it treats hardware configuration, input stress, potential synergistic effects, types and severity of hazards, and the probability of hazard occurrences. However, tests which may interact with each other in a synergistic fashion (e.g. vibration/shock or vibration/climate) must not be removed from the sequence.

c. Additional munitions beyond those recommended in this document may be needed in the test program for baseline purposes and to replace items that become damaged during testing. Also, fully inert munitions may be required for pre-cursor testing (thermal and mechanical) to evaluate and certify test procedures, setups, and fixtures.

d. Completely functional AURs are only required for test assets designated for the AUR level dynamic firing tests. For all other test assets, non-safety critical components (e.g. tactical guidance and control sections) may be removed in order to reduce test cost. Any hardware that is removed should be replaced by mass simulants with thermal, structural, and dynamic characteristics similar to the tactical hardware.

6.7.2 Tailoring of Test Sample Quantities.

The test sample quantities or configuration may be modified provided rationale is approved by the appropriate National S3 Authority(ies) or other appropriate Authorities. For example, the number of dynamically fired test items may be reduced if:

a. Previous firing tests of worst case pre-stressed and temperature conditioned munitions provide the required fuse arming test data. Data from the previous firing tests is required to be provided with the new S3 assessment file.

b. The fuse arming tests are not applicable, i.e., specific munitions classes may not contain a warhead such as kinetic energy munitions.

7. PRE AND POST-TEST EXAMINATIONS.

Perform examinations of the munitions as indicated in the sequential test flowcharts in Figure 1 and Annex B. Examinations are to be conducted in accordance with the examination levels defined below. Perform the appropriate inspections, checks, or disassembly before and after any non-destructive munition S3 test and when test exposure is considered to have affected the test item. Conduct radiographic and/or other non-destructive inspection of the test item to ascertain and document any external and internal conditions existing prior to, or resulting from testing. Safety mechanisms and devices shall remain in their safe condition. Non-destructive techniques utilized shall have the capability to accurately assess condition of the safety critical characteristics.

7.1 Initial (Baseline) Inspection.

An initial inspection should be conducted to verify conformance of the munition to the build standard (see AAS3P-1) and to provide an assessment of the baseline condition for subsequent test inspections. In addition to the Level 1 and Level 2 examinations described in Paragraphs 7.2 and 7.3, initial inspections should include baseline photographs and dimensions of the munition and packaging. Deviations from the build standard should be assessed by the appropriate authorities to determine that the asset(s) is satisfactory for the S3 test program.

7.2 Level 1 (Basic) Examination.

Level 1 (Basic) consists of visual examination and built in test (BIT). Visually inspect all test items to determine the following:

a. Condition of shipping container.

    (1) Physical damage.

    (2) State of pressurization, fluids, and seals.

    (3) State of desiccant and humidity indicators.

    (4) State of munition retention hardware.

    (5) State of shock and temperature indicators.

    (6) Container markings.

    (7) Electrical Earthing / grounding device.

b. Condition of the munition or subsystem.

    (1) Physical damage.

    (2) Indication of seepage, leaks, or exudation.

(3) State of indicators.

(4) State of seals.

(5) State of safe and arm (S&A) devices and fuzes.

(6) Munition markings.

(7) Check connectors.

(8) Collimation of sight sensor.

(9) Condition of exposed cables.

(10) BIT.

7.3 Level 2 (Intermediate) encompasses Level 1, but also consists of radiography and non-destructive examinations (i.e. ultrasonic, tomography, magna-flux, eddy-current, etc.) of all munitions and pyrotechnic devices. The examination facility should have the capability to conduct radiographic inspection at low temperature extremes or as soon as possible, but no longer than 15 minutes after removal from a cold conditioning chamber. Deviation from this should be recorded and accepted by the appropriate authority. Level 2 examinations should determine the following:

a. State of S&A devices and fuzes to include testing all accessible squibs with a certified low current circuit tester or squib meter and performing umbilical electrical tests to ensure the munition is safe for handling and continued testing.

b. Indications of structural damage.

c. Condition of the propulsion unit assembly to check for cracks, voids, slump, liner cracking/detachment, or any other failure modes identified during the preliminary design assessment. This examination should be conducted at the low operating temperature.

d. Condition of the warhead assembly to check for cracks, voids, defective adhesion, exudation, or any other failure modes identified during the preliminary design assessment. This examination should be conducted at the low operating temperature.

e. Movement of internal components.

7.4 Level 3 (Full) encompasses Level 1 and 2, but also includes disassembly for internal examination (i.e. BTCA). This is typified by destructive examination assessing the chemical (composition, hazard properties, etc) and physical (tensile, hardness, etc) properties of not just the explosive materials, but also of other critical engineering materials contained within the test item. Additional details are provided in Annex E.

8 S3 TEST PROGRAM OVERVIEW.

Two approaches to S3 testing, analytical and empirical, are presented in Annex B. While both approaches provide satisfactory confidence in the S3 assessment of any munition type, there are inherent benefits in terms of cost and test efficiency that tend to associate the Analytical S3 test approach with complex missile systems and the empirical S3 test approach with the smaller, less complex rocket and projectile systems.

a. Analytical S3 Test Approach.

The Analytical S3 Test Approach relies primarily on BTCA and component testing for evaluation of the munition condition following sequential environmental testing. This approach requires fewer test assets than the empirical S3 test approach since the data obtained provides a thorough assessment of the safety margin for the energetic materials and components. Furthermore, only the AUR level firing test assets are required to be fully functional AURs; thus, most of the test assets in the analytical S3 test program are not required to contain potentially expensive tactical guidance, control systems, or other components determined to be non-safety critical components. The analytical S3 test approach would normally be associated with the more complex or expensive missile systems for which the increased cost of BTCA and component testing is typically offset by the reduced quantity and the reduced per unit cost of the test assets.

b. Empirical S3 Test Approach.

The empirical S3 test approach relies almost completely on the results of the AUR level firing test assets for evaluation of the munition condition following sequential environmental testing. This approach requires more test assets than the analytical S3 test approach since, in the absence of analytical data from the energetic materials or components, more assets are required to establish safety margin of the system. All of the test assets in empirical S3 test approach are required to be fully functional AURs to support AUR level firing tests. For this reason, the empirical S3 test approach is not typically associated with complex missile systems containing expensive, non-safety related components.

8.1 Test Sample Quantities for the Analytical S3 Test Flow.

The recommended sample quantities for the analytical S3 test flow are shown in Annex B, Appendix 1, Tables B1-1 through B1-4, and illustrated in the test flow chart in Annex B, Appendix 1, Figures B1-1 and B1-2.

8.2 Test Sample Quantities for the Empirical S3 Test Flow.

The recommended sample quantities for the empirical S3 test flow are shown in Annex B, Appendix 2, Tables B2-1 through B2-4, and illustrated in the test flow chart in Annex B, Appendix 2, Figures B2-1 and B2-2.

8.3 Sequential Environmental Tests.

The general test sequences for the analytical and empirical S3 test approaches for shoulder launched munitions are illustrated in Figures 1 and 2. Specific test sequences for the two approaches are provided in Annex B. An attempt has been made to address all environments described in AECTP 100, Annex A, based on the representative LCEP for shoulder launched munitions. Assessment tests use complete, live all-up rounds except as noted in these procedures. Whenever possible, environmental test details are deferred to the STANAG 4370 AECTPs referenced in the sequential test procedures. For test methods which are not currently covered by a STANAG and/or Allied Publication (AP), reference should be made to the appropriate International Test Operation Procedures (ITOP) or National document. Background and rationale for these tests are provided in Annex A, Appendix 1.

8.4 Operating Tests.

Annex D provides descriptions of the AUR and Component Level Tests required on munitions that have undergone sequential environmental testing.

8.4.1 AUR Level Firing Tests (Unmanned Dynamic Firings).

Annex D, Appendix 1 describes the AUR firings required for munitions that have undergone sequential environmental testing to evaluate firing safety (at motor ignition); munition operation, launch, and flight safety; warhead minimum arming distance; and firing from enclosure. The unmanned firings are also used to evaluate the need for supplemental testing. Health hazard and weapon danger area data should be acquired during AUR Level Firing Tests as described in Annex D. Background and rationale for these tests are provided in Annex A, Appendix 2.

8.4.2 Component Level Tests.

Annex D, Appendix 2 describes the component level tests required for munitions that have undergone sequential environmental testing under the analytical S3 test approach. Component level assessment of energetic and pressure vessel components is required in order to estimate the probability and severity of failure during operational use. In addition to warheads and rocket motors, other items may require these tests. Examples are gas generators, pressure vessels, safe and arm devices, or thermal batteries which could present a hazard to personnel. Background and rationale for these tests are provided in Annex A, Appendix 2.

8.5 Operational and Maintenance Review.

Annex H, Appendix 3 describes the operational tests required to assess the safety of operational and maintenance procedures and equipment during field handling exercises.

9. ADDITIONAL TESTS AND ASSESSMENTS.

Hazard Classification, Insensitive Muntions (IM) Assessment, and Munition Software System Safety Assessment are required as part of the S3 Package but the details regarding the series of tests required are not provided in this document since they are governed by other STANAGs. References to the governing STANAGs are provided.

9.1 Munition Hazard Classification.

Appropriate munition hazard classification testing shall be conducted in accordance with STANAG 4123 and AASTP-3.

9.2 Insensitive Munitions (IM) Assessment.

The IM assessment testing shall be conducted in accordance with STANAG 4439 and AOP-39. For a system expected to have significant changes to its vulnerability with age/use, using environmentally stressed munitions within IM vulnerability test and assessment should be considered.

9.3 Munition Software System Safety Assessment.

Munition software shall be designed, assessed and tested to assure its safety and suitability for service in accordance with AOP-52.

9.4 Firing Circuits.

Conduct a full hazard assessment using Fault Tree Analysis (FTA), Failure Modes and Criticality Effects Analysis (FMECA), and sneak circuit analysis techniques, and examine the firing system for adequacy of design and safety features and for compliance with specifications. Use examinations and simulated firings to determine that firing switches and interlocks are located so as to protect against accidental firings and that firing circuit connections are protected against accidental grounding or shorting. Development testing should include tests to ensure the firing circuit acts as intended and that it will not fire when faults are introduced into the circuit.

9.5 Fuze Safety Testing.

The central objective of S3 of Fuzing Systems is to confirm and document that the fuzing system is safe and performs as intended in all expected service environments. The design safety requirements standard is STANAG 4187 and the fuze procedures document is AOP-20. Test Requirements for S3 Assessment is STANAG 4157, which is based on the principles of AOP-15.

9.6 Electromagnetic Environmental Effects (E3).

E3 assessment testing shall be conducted in accordance with STANAG 4370, AECTP 250 and 500. This testing must address Hazards of Electromagnetic Radiation to Ordnance (HERO), Electrostatic Discharge (ESD), lightning tests, and firing circuit analysis that are required to demonstrate electrical safety. Expected test asset quantities are provided in Annex B. General guidance is provided in Annex H, Appendix 1.

9.7 Munition Demilitarization and Disposal Assessment Testing.

Appropriate safety testing and analysis to assess the demilitarisation and disposal qualities of a munition shall be required in accordance with STANAG 4518.

9.8 Render Safe Procedure Testing.

Appropriate testing and analysis shall be performed to develop Explosive Ordnance Disposal (EOD) render safe procedures for new munitions entering the inventory.

9.9 Range Safety and Sustainability.

In accordance with AOP-15, appropriate testing and analysis shall be conducted to assess range safety and sustainability. The potential for individual and cumulative environmental effects of munitions use on operational ranges, e.g., the expected deposition of hazardous substances, pollutants and contaminants, or emerging contaminants should be assessed.

9.10 Explosive Materials Qualification Testing.

All explosive materials in a munition shall undergo appropriate testing and assessment per STANAG 4170 and AOP-7 to determine whether each possesses properties which make it safe for consideration for use in its intended role.

9.11 Health Hazards Testing.

Annex H, Appendix 2 describes the testing and analysis to assess potential health hazards posed by the elements or combinations present in munitions and by munitions use.

10 MUNITION SAFETY DATA PACKAGE.

As stated in AAS3P-1 and AOP-15 Annex C, the results of the testing and assessments required in this document will be compiled into a Munition Safety Data Package for use by the appropriate S3 approving authority in determining the overall S3 for shoulder launched munitions.

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ANNEX A. BACKGROUND/RATIONALE.

1 INTRODUCTION.

This Annex provides background information and rationale for the sample quantities and test environments recommended by this document. Formal safety testing is required to establish test data, which supports the issuance of the safety certification. The tests may indicate that limitations or restrictions must be imposed when the safety certification is issued. These restrictions may be imposed to limit exposure to certain environments (climatic, dynamic, electromagnetic, etc.), to restrict methods of transportation, or to define special handling and operating procedures. Generally, because of increased severity associated with safety testing, satisfactory performance of the test item is not required. Poor performance after exposure to test environments may indicate a need for further investigation.

2 SAMPLE QUANTITIES AND STATISTICAL CONSIDERATIONS.

The sample size recommendations of this document are based on prior tests of similar weapons and ammunition, rather than strictly statistical considerations. Serious hazards such as warhead detonation or rocket motor burst at launch are observed as binomial (pass or fail) events, but the parameters that cause these events are unlikely to be so. For a simple binomial assessment, the predicted low failure rate coupled with a requirement for high statistical confidence, the sample sizes become very large, sometimes in excess of the eventual service population. This is not practical. Therefore, other approaches are required in combination of statistical methods to estimate the residual safety margin based on measured parameters. For sequential environmental testing, confidence is built by ensuring the test environment provides the maximum feasible cumulative stress to the test items. Statistical methods are used to derive the test severities, to ensure as far as practical, that they envelope the predicted environment. However, as stated above, the final test quantities presented in this document are a compromise based upon the experience of a large international community of subject matter experts.

2.1 Performance Test Data.

As described above, successful performance tests (component and munition level) with and without environmental exposure add confidence to the safety of the munition. Utilization of these data effectively increases the total number of samples.

2.2 Increased-Severity Testing.

In order to yield acceptable confidence in safety test results with a relatively small sample size, increased-severity testing is prescribed in this document. The probability of munition failure resulting in a hazardous condition is increased by testing under conditions, which are representative of credible extremes or slightly above the environments to be encountered in actual munition use. These extreme environments are low-probability environments. Therefore, the test levels recommended in this document are at credible extremes. Rationale for the specific environments is presented in Appendix 1 of this Annex.

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2.3 Sequential and Combined Environments.

Munitions are subjected to environmental testing in a sequential manner, which is representative of the probable LCEP scenario. Testing in accordance with this life cycle sequence and combining environments (i.e., vibration with temperature) is recommended to determine if the interaction (synergistic effect) and/or the sequence in which environments are experienced may result in a safety hazard.

2.4 Inspection For Incipient Failure.

For each test sample which fails during test, there are usually many that nearly fail. Detailed inspection of the test items before, during, and after test adds significantly to the confidence of the test data given the limited sample size. Radiographic inspections provide particularly useful insight into the condition of the munition including early detection of displaced components as well as cracking or debonding of energetic materials. Conditioning the munition to a cold temperature for the radiographic inspection enhances cracks in the energetic materials and provides for easier detection of defects. If the inspections indicate that failure is likely to occur or nearly occurred, further investigation or testing may be required. If the inspections indicate that a margin of safety exists and that no safety hazard is likely to occur, additional confidence in the data is gained.

2.5 Variable Test Data

The use of measured variable data (pressure, force, strain, etc.) is recommended whenever practical. If margins of safety can be demonstrated between measured test data and measured or analytical failure modes, confidence in the test results are enhanced. If measured variable data indicate only small margins of safety exist, further investigation or testing may be required.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

1 GENERAL.

1.1 LCEP.

During its expected life cycle, a munition will experience transportation from its place of manufacture to a storage facility, transportation to a place of temporary storage in an Operational Theater, before tactical transportation within that Operational Theater, and finally function or return to storage. At each stage it will experience exposure to various environments resulting from the local climate, general rough handling, and transportation by numerous platforms. It may also experience abnormal environments such as being accidentally dropped.

1.2 Test Levels.

This Appendix gives rationale for the specific test procedures and test severities recommended in this document. The test levels are credible extreme environments, to which the inventory may be exposed as part of the LCEP. Conflicts between the recommended test levels and munition specific LCEP environments should be addressed through test tailoring and/or safety release restrictions.

1.3 Temperatures.

Munitions are required to remain safe and suitable for service at extremes of temperature where personnel are expected to be capable of military operations, namely within NATO climate categories C2 to A1. It would be expected for the munitions to remain S3 during and following storage and transportation by various platforms within these climate categories. The extreme temperatures of these climate categories (or the SRE for hot stream weapons) form the basis for the conditioning temperatures for all mechanical environment tests. Munitions are also expected to remain safe and suitable following storage at extreme cold conditions of a C3 climate category, but would not necessarily be expected to be moved during the coldest period within this climate zone due to difficulties with vehicles and the temperatures being outside the human comfort zone (i.e. survival as opposed to capable of military operations). For this reason, the cold temperature extreme for mechanical environmental tests have been based on the C2 climate category.

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APPENDIX 1. ENVIRONMENTAL TESTS.

1.4 Temperature Stabilization.

For environmental tests that require temperature conditioning, temperature stabilization is achieved when the part of the item considered to have the longest thermal lag is changing no more than 2 ºC per hour. Since it may not be practical to monitor the interior parts of a live munition with the longest thermal lag during test without damaging seals, the stabilization time may be determined prior to live munition testing using an instrumented thermally equivalent inert munition. The stabilization time will typically be required for the munition in both the unpackaged and the transport configurations and at the hot and cold temperature extremes. As an alternative, a default duration of 24 hours may be applied after the chamber air around the test article has stabilized to the test temperature.

1.5 Solar Radiation Equivalent (SRE) Temperature.

As an alternative to installing solar lamps in a vibration test chamber, the SRE temperature is specified in most mechanical environment tests in order to facilitate testing. The SRE is the maximum temperature value experienced by the energetic material (e.g. rocket motor propellant, warhead main charge) after exposure to direct or indirect solar radiation. Determination of this value will require exposure of an inert, internally instrumented munition, with similar thermal characteristics to the All-Up Round, to the full solar test requirement defined in Annex C, Appendix 1, paragraph 5. The SRE temperature should be determined for both the packaged and unpackaged state, and applied for all mechanical environment tests such that the packaged SRE is used for packaged tests and the unpackaged SRE for the unpackaged tests. In the absence of this data, a value of +71 ºC should be used in lieu of the SRE temperature since this reflects the maximum value of the A1 Storage and Transit diurnal cycle defined in AECTP 230 Leaflet 2310/1.

2 CLIMATIC ENVIRONMENT TESTS (ANNEX C, APPENDIX 1).

Provided below are the rationale for the climatic exposure tests. If only one test configuration (packaged or unpackaged) is to be used, it must represent the most severe configuration for the item under test. In most, but not all cases, this is likely to be the unpackaged configuration.

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APPENDIX 1. ENVIRONMENTAL TESTS.

2.1 Humid Heat (Annex C, Appendix 1, Paragraph 1).

The humid heat test is performed to determine the resistance of materiel to the effects of a warm humid atmosphere. Materiel may be exposed to this environment year-round in tropical areas and seasonally in mid-latitude areas. The procedure recommended by this document is an aggravated test. It does not reproduce naturally occurring or service-induced temperature-humidity scenarios. In order to reduce the time and cost of testing, the test item is exposed to higher temperature and humidity levels than those found in nature; however, the exposure duration is shorter. A minimum of ten test cycles has proven to be effective at inducing degradation/failures that are indicative of long-term effects. For test items incorporating seals which protect moisture sensitive materials, longer test durations may be required to obtain a higher degree of confidence that the munition will remain S3 in warm-humid conditions.

2.2 Low Temperature Storage (Annex C, Appendix 1, Paragraph 2).

The low-temperature storage test is performed to determine the effects of low-temperature storage on the munition. There is a 1 percent probability that materiel deployed in arctic areas (Category C3, AECTP 200) will be exposed to a -51 ºC. Category C3 applies to the coldest area of the North American continent and the areas surrounding the coldest parts of Siberia and Greenland. The low temperature can be expected to dwell once reached with no solar heating effects. A minimum of three days is recommended since this is considered sufficient duration to thermally stabilize the munition. Since this is a temperature dwell test it should be noted that this will not exercise cold temperature thermo-mechanical degradation mechanisms. The temperature shock tests are considered adequate to investigate these effects.

2.3 High Temperature Storage (Annex C, Appendix 1, Paragraph 3).

The high-temperature storage test is intended to accelerate chemical based degradation mechanisms via a period of testing using a constant elevated temperature. A constant temperature of 71 ºC is considered appropriate since this reflects the peak temperatures likely to be encountered during field storage or full solar exposure. Nine days of testing has been calculated (using the Arrhenius relationship) to give a similar degree of chemical degradation to that expected for 28 A1 'Storage and Transit' temperature cycles using an assumed activation energy of 70 kJ/mol for the degradation mechanism. Alternatively, a constant temperature of 60 ºC may be more appropriate where the use of 71 ºC is thought to generate unrealistic degradation (e.g. for nitro-cellulose + nitro-glycerine based propellants). The 60 ºC temperature will require a longer test duration of 19 days. If it can be demonstrated that the hot stream test assets, during the mechanical environment tests, will experience sufficient duration at a temperature in excess of the unpackaged SRE, then the fixed temperature test duration may be reduced as long as it can be shown to produce equivalent chemical degradation using the Arrhenius relationship. No such tailoring is advised for the cold stream test assets.

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APPENDIX 1. ENVIRONMENTAL TESTS.

2.4 High-Temperature Cycling (Annex C, Appendix 1, Paragraph 4).

The high- temperature cycling test is performed to determine the effects of high- temperature storage and operational environments on the munition. The temperatures associated with the high-temperature cycling test are created by meteorological air temperatures combined with solar radiation. The induced air temperature diurnal cycle (A1) for Category A storage and transit conditions given in AECTP 200 Leaflet 2310/1, Annex A, is assumed to represent worst-case.

2.5 Solar (Annex C, Appendix 1, Paragraph 5).

This test is intended to aggravate those thermally induced degradation mechanisms associated with elevated skin temperatures and thermal gradients within the weapon, that are induced due to solar radiation. Since most nations solar test chambers do not incorporate the ultraviolet element of the spectrum, they tend not to aggravate the photo-chemical (actinic) degradation modes associated with solar radiation. If this is of concern (as may be the case for some paints, adhesives, and polymers) then a separate ultra-violet exposure test will also be required. A minimum of seven A1 climate category cycles (meteorological temperature and solar radiation) is recommended in order to attain the maximum elevated temperatures throughout the test item. The solar radiation level of 1120 W/m² is derived from AECTP 200.

2.6 Low-Temperature Shock (Annex C, Appendix 1, Paragraph 6.a).

This test simulates movement of warm munitions from storage, or from a transport vehicle in maintenance, to an extreme cold environment or vice versa. The low-temperature shock test consists of five temperature shock cycles between the temperatures of 21 ºC (standard ambient) and -51 ºC. In most applications, the munition will be exposed to the temperature shock environment in its logistic container. However, to address the most severe condition, the munition should be tested in its unpackaged configuration.

a. The -51 ºC temperature is the low extreme presented in AECTP 200, for Climate Category C3.

b. Stabilization at the temperature extremes is required. Munitions in storage or in warm buildings associated with vehicle maintenance would likely achieve temperature stabilization. Also, the extremely low temperatures encountered in the natural environment are likely to persist longer than the munition temperature stabilization time.

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APPENDIX 1. ENVIRONMENTAL TESTS.

2.7 High-Temperature Shock (Annex C, Appendix 1, Paragraph 6.b).

This test exposes the munitions to rapid temperature transition from -5 ºC (temperature at an altitude of 8 km, from AECTP 230 Leaflet 2311/2 Table 3) to the unpackaged SRE temperature.

a. This test simulates rapid movement of munitions under the following scenarios:

1. Rapid ascent from a desert airfield to high altitude (8 km) in an unheated aircraft compartment or carried externally.

2. Air delivery or airdrop from high altitude (8 km) to a desert environment.

b. Stabilization at the temperature extremes is required. Munitions in flight prior to air delivery would likely achieve temperature stabilization. Also, the extremely high temperatures encountered in the natural environment are likely to persist longer than the munition temperature stabilization time.

2.8 Immersion (Annex C, Appendix 1, Paragraph 7).

Munitions may be exposed to water immersion during fording. The immersion test determines if the ingress of water affects materials and performance of the munition. This test requires temperature conditioning of the munition to establish a pressure differential (on cooling) to determine whether the seals or gaskets leak under relatively low pressure differential, and to induce expansion/contraction of materials. Temperature conditioning the item to 27 ºC above the water temperature represents exposure to solar heating immediately prior to immersion. Thirty minutes of immersion at a depth of one meter is required.

2.9 Salt Fog (Annex C, Appendix 1, Paragraph 8).

a. The salt fog test (AECTP 300, Method 309) provides a set of repeatable conditions to determine the relative resistance of the munition to the effects of an aqueous salt atmosphere. This test locates potential problem areas, quality control deficiencies, design flaws, etc., in a relatively short period of time and is required for munitions that will experience significant exposure (as opposed to infrequent or irregular) to high levels of salt in the atmosphere.

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b. As a minimum, this JOTP requires two cycles of alternating wet-dry-wet-dry conditions of 24 hours each to be imposed. Experience has shown that alternating periods of salt fog exposure and drying conditions provides a more realistic exposure and a higher damage potential than does continuous exposure to a salt atmosphere. The munition is tested in the most severe configuration; that is, outside of its shipping/storage container. The number of cycles may be increased if a higher degree of confidence is required to assess the ability of the materials involved to withstand a corrosive environment. Note, there is no relationship between this test and any real world exposure duration, but it does provide an indication of potential problem areas associated with the salt (maritime) environment, nearby water sources, and from salted roads during winter operations.

2.10 Sand and Dust (Annex C, Appendix 1, Paragraph 9).

a. The sand and dust test (AECTP 300, Method 313, Procedures I and II) determines the effects on munitions after exposure to dust and sand laden atmospheres. Dust consists of particle sizes less than 150 microns. Sand has particle sizes greater than or equal to 150 microns.

b. Munitions may be exposed to sand and dust environments on a worldwide basis. The greatest exposure would be expected during operations in desert regions due to vehicle convoys and aircraft/helicopter movements. The movement of military vehicles in hot dry desert regions or in areas where the surface is liable to break up into small particulate is liable to result in dust and sand-laden atmospheres. Munitions may also be carried or worn by personnel during operation of aircraft on airfields and are likely to be directly subjected to artificially blown dust and sand. Lastly, during tactical manoeuvres that require foot soldiers to crawl along the ground, the munition may be carried or dragged over the surface and is vulnerable to the ingress of small particulate dust and sand. Material deposited inside the munition may cause short-circuiting, build-up of static electricity, interference between moving parts, and contamination of any lubrication systems. This JOTP requires the munition to be tested in the most severe configuration; that is, outside of its shipping/storage container, using the most severe exposure parameters defined in Procedures I and II of Method 313.

2.11 Rain/Watertightness (Annex C, Appendix 1, Paragraph 10).

The rain test (AECTP 300, Method 310, Procedure I, Part 3) recommends using a 100±20 mm/hr severity for a duration of two hours, which is consistent with Part 3 of Method 310, Procedure 1. This is considered adequate to address exposure throughout most of the world apart from tropical zones where rainfall rates can be much higher. If deployment to tropical zones is anticipated then the munition should probably be subjected to the higher severity of 200±50 mm/hr. However, it should also be considered whether the munition will actually be fielded during a tropical rainstorm. If not then the ‘typical’ worldwide severity would be adequate. This JOTP requires the munition to be tested in the most severe configuration; that is, outside of its shipping/storage container.

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APPENDIX 1. ENVIRONMENTAL TESTS.

2.12 Icing (Annex C, Appendix 1, Paragraph 11).

Munitions are likely to be exposed to severe icing in cold climates. The icing test (AECTP 300, Method 311) determines the potential damaging effects of icing on the munition where stresses are imposed at joints and interfaces of adjacent parts. Damage may also be incurred as a result of the methods used to remove the ice and the subsequent accumulation of moisture after melting of the ice. The principal sources of ice are frosting, freezing rain, refreezing of thawing snow, and freezing of condensation. The thickness of the ice deposited on the item depends upon the duration of the exposure and the contours of the munition. Medium ice loading conditions are required by this JOTP with the munition being in the most severe configuration; that is, outside of its shipping/storage container.

2.13 Low Pressure (Altitude) (Annex C, Appendix 1, Paragraph 12).

Some shoulder launched munitions include fluid counter masses intended to reduce recoil. Rapid decompression may result in seal damage to the fluid system resulting in unacceptable recoil and potential injury to the operator during firing. As a worst case, the highest value specified in Table 1 of AECTP 300, Method 312 should be applied.

2.14 Mold Growth (Fungus and Biological Hazards) (Annex H, Appendix 6, Paragraph 1).

Microbial deterioration is a function of temperature and humidity and is an inseparable condition of hot-humid tropics and the mid-latitudes. AECTP 300, Method 308 is used to determine if mould growth will occur and, if so, how it may degrade/impact the use of the munition. Twenty-eight days is the minimum test period to allow for mould germination, breakdown of carbon-containing molecules, and degradation of material. This is a non-sequential test and may be conducted on leftover components or material samples.

2.15 Contamination by Fluids (Annex H, Appendix 6, Paragraph 2).

Contamination of the munition may arise from exposure to fuels, hydraulic fluids, lubricating oils, solvents and cleaning fluids, de-icing and anti-freeze fluids, insecticides, sunblock, disinfectants, coolant dielectric fluid, and fire extinguishants. Select the fluids most commonly encountered throughout the munitions life cycle and apply to the unpackaged item per AECTP 300, Method 314 using the intermittent exposure method. Contamination effects must be analyzed for its immediate or potential (long term) effects on the proper functioning of the munition.

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3 MECHANICAL ENVIRONMENT TESTS.

Provided below are the rationale for the dynamic environments likely to result from normal usage in severe environmental conditions, or from plausible mishandling during logistic and field operations. The weapons should be tested following temperature conditioning at either the SRE temperature (packaged or unpackaged as appropriate for the test configuration) for the hot weapons and -46 ºC for the cold weapons (rationale given at Appendix 1, paragraphs 1.3 and 1.5).

3.1 Common Carrier Vibration (Annex C, Appendix 2, Paragraph 1.1).

Common carrier transportation is the shipment of materiel from the point of manufacture to the storage location or user installation. This movement is usually accomplished by large logistic vehicles (commercial and military) over improved or paved highways. This is the first test to be performed in the shoulder launched munition S3 environmental test sequence. The intent is to degrade the shipping container and weapon seals prior to the climatic environmental tests.

a. Test Temperature.

Transport temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Although munitions may be stored in C3 regions, transport is not expected at the extreme temperatures of C3. Common carrier transportation should be conducted with half of the test sample at the packaged SRE temperature and half of the test sample at the cold operational temperature extreme of -46 ºC.

b. Test Configuration.

Munitions may be transported in the single munition or bulk munition (palletized) transport configuration. Selection of the test configuration may be based on available test equipment, quantity of test assets, or efficiency of test operations.

c. Test Level.

The ‘Ground Wheeled Common Carrier’ vibration profiles in AECTP 400, Method 401 represent transport in both commercial and military land vehicles over improved roads. No factors of safety are applied to the amplitude since AECTP 400 vibration schedules are specified. These schedules have been developed from field data and have conservatism factors built into the spectra.

d. Test Duration.

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Common carrier vibration should be applied for a duration equivalent to the combined distances specified in AECTP 100 for the commercial and military land vehicles in the transportation mode for shoulder launched munitions.

3.2 Rail Transportation Dynamics.

3.2.1 Rail Transportation Vibration.

Rail vibration would normally be conducted in accordance with AECTP 400, Method 401, Annex E. Based on an assessment that this environment is relatively benign compared to other S3 test environments, this test was eliminated as a requirement for Shoulder Launched Munitions.

3.2.2 Rail Impact.

Rail impact testing would normally be conducted in accordance with AECTP 400, Method 416. Based on an assessment that this environment is relatively benign compared to other S3 test environments, this test was eliminated as a requirement for Shoulder Launched Munitions. This test may still be a requirement for military transportation certification in the US.

3.3 Packaged Transit Drop (Annex C, Appendix 2, Paragraph 1.2).

The packaged handling drop test simulates accidental drops encountered in logistical (packaged) handling of the munitions such as a hovering helicopter dropping the munitions from a sling or the unloading of munitions stacked on a truck. Due to the severity and accidental nature of this test environment, it is recommended that only half the total number of S3 test assets be exposed to the Packaged Handling Drop.

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. The Packaged Transit Drop Test should be conducted with half of the packaged transit drop test sample at the packaged SRE and the other half of the packaged transit drop test sample at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

Packaged drops can occur in either the single munition or bulk munition (palletized) configuration. As worst case, the drop test configuration should be as a single packaged munition. This allows the sample to be divided among the drop orientations specified in Annex C, Appendix 2, paragraph 1.2.

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c. Drop Height.

The recommended drop height of 2.1 meters is based on the likelihood of a shoulder launched munition being expected to fire safely following a drop, in the shipping container, from the bed of a transport vehicle. If a worst case scenario is identified that exceeds the recommended 2.1 meters, that height may be used for this test. However, the drop test height should be no less than the recommended 2.1 meters.

d. Number of Drops.

It is not expected that a shoulder launched munition would be dropped more than once from this height during its service life. However, as a worst case scenario, two drops are required for the 2.1 meter packaged drop. Justification may be provided to reduce this requirement to one drop if it is expected that unacceptable damage will result from more than one 2.1 meter drop.

3.4 Logistic Drop (Annex C, Appendix 2, Paragraph 1.3).

This mandatory logistic drop test, as described in STANAG 4375, assesses the safety of the weapon when exposed to a free-fall drop which may be encountered during ship loading operations.

3.5 Land Transportation Dynamics - Tactical (Annex C, Appendix 2, Paragraph 2.0).

Tactical land transport dynamics includes secured tactical wheeled and tracked vehicle vibration environments as well as unsecured (loose) cargo and restrained cargo shocks with the munition in a tactical configuration. Each of these tests must be conducted in order to meet the combat platform dynamic test requirements and cannot be tailored out. The distances for each mode of transport are provided in Table A-1 and are based on percentages of the distance specified in AECTP 100 for man portable munitions on a combat platform. An example based on AECTP 100-4 and AECTP 400-3 is provided in Table A-2.

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TABLE A-1. COMBAT PLATFORM DISTANCES

TRANSPORT MODE	PERCENTAGE OF AECTP 100 DISTANCE
Secured Cargo – Wheeled Vehicle	70% (35% packaged/35% unpackaged) (3500 km minimum)
Secured Cargo – Two Wheeled Trailer	5% (2.5% packaged/2.5% unpackaged) (250 km minimum)
Secured Cargo – Tracked Vehicle	20% (all unpackaged) (1000 km minimum)
Loose Cargo	5% (either unpackaged or unpackaged) (240 km minimum)
Restrained Cargo Transport Shock	20% (unpackaged) (1000 km minimum)

TABLE A-2. COMBAT PLATFORM TEST DURATION EXAMPLES
BASED ON AECTPS 100-4 AND 400-3

TRANSPORT MODE	PERCENTAGE OF AECTP 100 DISTANCE	AECTP 100-4 COMBAT PLATFORM DISTANCE FOR SHOULDER LAUNCHED MUNITIONS[a] (KM)	AAS3P-10 DISTANCES BASED ON AECTP 100-4[a] (KM)	AECTP 400-3 TEST TIME-DISTANCE RELATION[b] (MIN/AXIS=KM)	AAS3P-10 TEST DURATIONS BASED ON AECTPS 100-4 [a] AND 400-3[a] (MINUTES/AXIS)
Secured Cargo - Tactical Wheeled Vehicle	35% packaged 35% unpackaged	5,000 km	1750 1750	40 min/axis= 805 km	87 87
Secured Cargo - Two Wheeled Trailer	2.5% packaged 2.5%unpackaged		125 125	32 min/axis= 52 km	77 77
Secured Cargo - Tracked Vehicle	20% unpackaged		1000	45 min/axis= 1600 km	28
Loose Cargo	5% packaged or unpackaged		240	20 min/axis= 240 km	20
Restrained Cargo Transport Shock	20% unpackaged		1000	Number of shocks in Table A-1 = 1000 km	See Table A-1

Note a: AECTP 100-4 distances provided as example only. The most current AECTP 100 values should be applied.

Note b: AECTP 400-3 time/distance relations provided as example only. The most current AECTP 400 values should be applied.

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3.5.1 Wheeled Vehicle Transportation Vibration – Secured Cargo (Annex C, Appendix 2, Paragraph 2.1.1).

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the secured cargo vibration test quantity should be conducted at the appropriate packaged or unpackaged SRE temperature, and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

Unless it can be shown otherwise, the munitions should be tested for half the distance packaged in the shipping container and half the distance unpackaged. The minimum distances specified in Table A-1 are based on AECTP-100, Edition 4.

c. Test Level.

It is recommended that the default Tactical Wheeled Vehicle (TWV) and Two Wheeled Trailer (TWT) curves in AECTP 400, Method 401 be used to provide a conservative set of vibration curves consistent with a wide range of potential transport vehicles encountered in NATO service. No factors of safety are applied to the amplitude since these schedules have been developed from field data and have conservatism factors built into the spectra.

d. Test Duration.

The duration of the test is based on the typical usage profile in AECTP 100 for a man portable munition on the combat platform. The distance in AECTP 100 for combat platform encompasses both wheeled vehicles and two wheeled trailers. An assumption is made that roughly 70% of this distance can be considered Composite Tactical Wheeled Vehicle and the 5% can be considered Two Wheeled Trailer.

3.5.2 Restrained Cargo Transport Shock (Annex C, Appendix 2, Paragraph 2.3).

Restrained cargo shock testing is required to address minor obstacle negotiation for wheeled and tracked vehicles, particularly those travelling in an off-road role.

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the test quantity should be conducted at the unpackaged SRE temperature and the other half at the cold storage temperature extreme of -46 ºC.

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b. Test Configuration.

The munitions should be tested in the tactical (unpackaged) configuration to represent the worst case transport condition.

c. Test Levels.

The Restrained Cargo Transport Shock levels in Edition 3 of AECTP 400, Method 403, are not currently considered sufficient to satisfy the intent of this test. These levels specified in Table C2-1, are based on Def-Stan 00-35, Part 3, Issue 4 and are considered to be more representative of the actual field levels. These levels are planned to be incorporated in Edition 4 of AECTP 400, Method 403.

d. Test Duration.

The number of restrained cargo transport shocks is based on the distance transported in a tactical off-road vehicle. The typical usage profile in AECTP 100 identifies the distance for man portable munitions on the combat platform, of which 20% of this distance is estimated to be tactical off-road vehicles. The number of shocks specified in Table C2-1 represents 1000 km of transport.

3.5.3 Tracked Vehicle Transportation Vibration (Annex C, Appendix 2, Paragraph 2.2).

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the test quantity should be conducted at the unpackaged SRE temperature, and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

The munitions should be tested in the tactical (unpackaged) configuration to represent the worst case transport condition.

c. Test Levels.

The Secured Cargo, Tracked Vehicle vibration test should be conducted using the AECTP 400, Method 401, Annex B, Light Vehicle - Material on Sponson or Installed in Hull vibration test schedules.

d. Test Duration.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

It is estimated that shoulder launched munitions will be transported as secured cargo on tracked vehicles at least 20% of the distance travelled in a combat vehicle. Based on this assumption, it is recommended that the tracked vehicle vibration be applied for a duration equivalent to the 20% of the distance specified in AECTP 100 for man portable munition on the combat platform. The minimum duration specified in Table A-1 is based on AECTP-100, Edition 4.

3.5.4 Loose Cargo (Annex C, Appendix 2, Paragraph 2.1.2).

The loose cargo test simulates the transport of items as unsecured cargo.

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the loose cargo test quantity should be conducted at the packaged or unpackaged SRE temperature, depending on the test configuration, and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

Half of the loose cargo munitions should be tested in the tactical (unpackaged) configuration and the other half should be tested in the individual, packaged configuration.

c. Test Level.

The munitions should be subjected to loose cargo tests in accordance with AECTP 400, Method 406, Procedure I or II, depending on the item configuration.

d. Test Duration.

It is estimated that shoulder launched munitions will be transported as unsecured cargo at least 5% of the distance travelled in a combat vehicle. Based on this assumption, it is recommended that the loose cargo test be applied for a duration equivalent to the 5% of the distance specified in AECTP 100 for man portable munitions on the combat platform. As recommended by Method 406 for sequential munitions safety testing, the munitions should be oriented horizontally for half the duration of the test followed by half the duration in the vertical orientation. The minimum duration specified in Table A-1 is based on AECTP-100, Edition 4.

3.6 Unpackaged Handling Drop (Annex C, Appendix 2, Paragraph 2.3).

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

The unpackaged handling drop test simulates accidental drops of unpackaged munitions during handling, operations, and maintenance. Due to the severity and accidental nature of this test environment, it is recommended that only half the total number of S3 test assets be exposed to the Packaged Handling Drop.

a. The recommended drop height of 1.5 meters is based on the likelihood of a shoulder launched munition being expected to fire safely following a drop (out of the shipping container and from the firing position ((shoulder level)), and still be expected to fire safely. If a worst case scenario is identified that exceeds the recommended 1.5 meters, that height may be used for this test. However, the drop test height should be no less than the recommended 1.5 meters.

b. A shoulder launched munition may be expected to be handled and launched safely following an unpackaged handling drop in either the carry or ready-to-fire configuration. The ready-to-fire configuration may include removal of end caps, extension of launcher, etc. Depending on the design of the munition, drops in the ready to fire configuration may not be required if damage is known to preclude the weapon from firing (e.g. exposed glass seeker). In this situation, all of the munitions would be dropped in the carry configuration.

c. Number of Drops.

It is not expected that a shoulder launched munition would be dropped more than once from this height during its service life. However, as a worst case scenario, two drops are required for the 1.5 meter unpackaged drop. Justification may be provided to reduce this requirement to one drop if it is expected that unacceptable damage will result from more than one 1.5 meter drop.

3.7 Sea Transportation Dynamics (Annex C, Appendix 2, Paragraph 4.0).

3.7.1 Ship Vibration.

Shipboard vibration would normally be conducted in accordance with AECTP 400, Method 401, Annex E. Per Leaflet 242/4, this environment is considered relatively benign compared to the road transportation vibration. Thus, this test is eliminated as an S3 requirement for Shoulder Launched Munitions.

3.7.2 Under Water Explosion (UNDEX) Shock (Annex C, Appendix 2, Paragraph 4.0).

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

The UNDEX test procedure should be conducted in accordance with AECTP 400, Method 419 or appropriate national standard. The overall basis for shipboard shock, from non-contact UNDEX qualification of equipment is addressed in Allied Navy Engineering Publication (ANEP) 43. Additional guidance may be found in NATO publications (STANAGs 4549 and 4150). UNDEX testing is a mandatory requirement prior to ship embarkation for some NATO Nations. In the assessment of UNDEX Shock, both the deck cargo and hold cargo environments were considered:

3.7.2.1 Cargo in the ship hold could be subjected to significant shock levels, but temperatures would be relatively benign (i.e. ambient). Under these loads, the requirement would be ‘Safe for Disposal’ and thus should be conducted as a non-sequential test. If deemed to be required as ‘Safe for Use’, the test should be conducted as a sequential test.

3.7.2.2 Deck cargo may be exposed to extreme temperatures (M1, M3); however, this is not an S3 test requirement since the shock severity would be significantly lower than other tests in the S3 sequence due to the separation from the shock event.

3.8 Air Transportation Vibration (Annex C, Appendix 2, Paragraph 5.0).

3.8.1 Fixed Wing Aircraft Cargo Vibration (Annex C, Appendix 2, Paragraph 5.1).

3.8.1.1 Turbo-Prop Aircraft Vibration (Annex C, Appendix 2, Paragraph 5.1.1).

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the test quantity should be conducted at the unpackaged SRE temperature, and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

The munitions should be tested in the packaged configuration, individual or palletized, to represent the most likely transport condition.

c. Test Levels.

The most likely propeller aircraft used to transport shoulder launched munitions is the C130K (4-blade, f0=68Hz) and the C130J (6-blade, f0=102Hz). The vibration levels for these aircraft are defined in AECTP 400, Method 401, Annex C, for Propeller Aircraft.

d. Test Duration.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

The test duration is based on AECTP 100, Annex E, Appendix 1, for Man Portable Missiles on Turboprop Aircraft. This duration should be split between the C130J and C130K environments.

3.8.1.2 Jet Aircraft Vibration (Annex C, Appendix 2, Paragraph 5.1.2).

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the test quantity should be conducted at the unpackaged SRE temperature, and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

The munitions should be tested in the packaged configuration, individual or palletized, to represent the most likely transport condition.

c. Test Levels. The vibration levels for jet aircraft are defined in AECTP 400, Method 401, Annex C, as ‘Jet Aircraft Cargo - Takeoff’ and ‘Jet Aircraft Cargo - Cruise’. The jet cargo aircraft vibration environment associated with takeoff is significantly more severe than the cruise levels, and thus the cruise levels may be eliminated as a requirement for S3 testing.

d. Test Duration.

The ‘Jet Aircraft Cargo - Takeoff’ vibration duration as defined in AECTP 400 is based on the number of takeoff events. The number of takeoff events in the life of a shoulder launched munition is estimated from the total flight duration defined in AECTP 100, Annex E, Appendix 1, for Man Portable Missiles on Jet Aircraft divided by an average flight duration of 10 hours per flight.

3.8.2 Helicopter Vibration (Annex C, Appendix 2, Paragraph 5.2).

a. Test Temperature.

Temperatures are based on the extreme storage temperatures associated with Climatic Category A1 and C2. Half of the test quantity should be conducted at the appropriate packaged or unpackaged SRE temperature and the other half at the cold storage temperature extreme of -46 ºC.

b. Test Configuration.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

Some packaging configurations may result in a more severe dynamic environment for the munition than the unpackaged configuration. Since shoulder launched munitions may be transported in either configuration, and it is not clear which of the two configurations results in a more severe environment for helicopter vibration, the helicopter vibration test should be split with half of the duration in the packaged and half of the duration in the unpackaged configuration.

c. Test Level.

Shoulder launched munitions may be transported on a variety of helicopters during a life cycle. Helicopter vibration levels are based on AECTP 400, Method 401, Annex D, 'Helicopter Cargo' with fundamental blade frequencies based on groupings of various likely battlefield helicopter types with cargo capacity including those listed in Table A-3.

TABLE A-3. HELICOPTER MAIN ROTOR PARAMETERS
(REF AECTP 400-3)

<table>
<tr><th rowspan="2">HELICOPTER</th><th colspan="4">MAIN ROTOR</th></tr>
<tr><th>ROTATION SPEED, Hz</th><th>NUMBER OF BLADES</th><th>f1, Hz</th><th>S3 TEST FREQUENCY (f1, Hz)</th></tr>
<tr><td>UH-1(Huey)</td><td>5.40</td><td>2</td><td>10.80</td><td rowspan="3">11Hz</td></tr>
<tr><td>CH-47D (Chinook)</td><td>3.75</td><td>3</td><td>11.25</td></tr>
<tr><td>OH-58A/C (Kiowa)</td><td>5.90</td><td>2</td><td>11.80</td></tr>
<tr><td>UH-60 (Black Hawk)</td><td>4.30</td><td>4</td><td>17.20</td><td rowspan="5">17 Hz</td></tr>
<tr><td>Sea King / Commando</td><td>3.48</td><td>5</td><td>17.40</td></tr>
<tr><td>Puma</td><td>4.42</td><td>4</td><td>17.68</td></tr>
<tr><td>EH101 (Merlin)</td><td>3.57</td><td>5</td><td>17.85</td></tr>
<tr><td>Gazelle</td><td>6.30</td><td>3</td><td>18.90</td></tr>
<tr><td>Lynx Mk 1, Mk 2 Mk 3</td><td>5.51</td><td>4</td><td>22.04</td><td rowspan="2">22 Hz</td></tr>
<tr><td>Lynx 3</td><td>5.51</td><td>4</td><td>22.04</td></tr>
<tr><td>OH-58D (K. Warrior)</td><td>6.60</td><td>4</td><td>26.40</td><td>26 Hz</td></tr>
</table>

d. Test Duration.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 1. ENVIRONMENTAL TESTS.

The total duration of the helicopter vibration test is based on the total flight hours specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missile in Helicopter Air Transportation. Shoulder launched munitions may be transported as either packaged or unpackaged cargo on any of the helicopters listed in Table A-3. The total duration should be divided evenly among the blade frequency groupings with half of each duration in the packaged and unpackaged configurations.

3.8.3 Low Velocity Parachute Drop (Annex C, Appendix 2, Paragraph 5.3).

Shoulder launched munitions are likely to be re-supplied by parachute delivery and are expected to remain S3 following such an event. Per AOP-20, Test E5, low velocity parachute delivery typically result in impact velocities of 8.7 m/s (28.5 ft/sec). Due to variations in parachute delivery systems throughout NATO service and potential variation of drop conditions (wind speed, angle, etc.), an elevated velocity of 12.5 m/s (41 ft/sec) should be applied. This environment is commonly replicated by an 8 m freefall drop unless specific and validated evidence is presented to the contrary. This value is consistent with Def-Stan 00-35. If it can be demonstrated that the shock loads to the munition in parachute drop are less severe in terms of velocity and spectral content to the 1.5 or 2.1 meter drop, parachute drop may be eliminated as a S3 test requirement.

3.8.4 High Velocity Parachute Drop (Annex H, Appendix 4, Paragraph 8).

Munitions that may be re-supplied by high-velocity parachute delivery are expected to remain S3 following such an event. Per AOP-20E, test E5, high velocity parachute systems may result in impact velocities of 27.4 m/s (90 ft/sec). This environment is commonly replicated by a 41 m (135 ft) freefall drop unless specific and validated evidence is presented to the contrary. This test should be conducted as a non-sequential test on a minimum of three munitions with live fuzes (other energetic components may be inert).

3.8.5 Malfunctioning Parachute Drop (Annex H, Appendix 4, Paragraph 9).

Munitions that may be re-supplied by parachute delivery are at risk of a malfunctioning parachute drop scenario and are expected to remain safe for disposal after such an event. Per AOP-20, Test E5, malfunctioning parachute systems may result in impact velocities of 45.7 m/s (150 ft/sec). In order to achieve the impact velocity of 45.7 m/s (150 ft/sec), this environment is commonly replicated by a 116 m (380 ft) freefall drop unless specific and validated evidence is presented to the contrary. This test should be conducted as a non-sequential test on a total of three munitions with live fuzes (other energetic components may be inert).

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 2. OPERATING TESTS.

1. AUR LEVEL FIRINGS (ANNEX D, APPENDIX 1).

a. Firing tests are conducted under various flight conditions (free flight, obstructed flight, and fire from enclosure) to determine firing safety related to munition operation, launch, and flight.

b. The AUR firings are conducted under both high and low temperature conditions. The high temperature tests should be conducted at 63 ºC or the unpackaged SRE temperature. The cold temperature tests should be conducted at -46 ºC. Although these values may be more severe than the manufacturers recommended upper and lower firing temperatures for munition performance, the extreme values should be used to assess safety aspects of the motor firing under worst case service conditions. Appropriate precautions should be taken if the firing temperature exceeds the manufacturer recommendations.

1.1 Free Flight Firing (Annex D, Appendix 1, Paragraph 1)

The free flight firing tests are conducted on an instrumented firing range to demonstrate that the munition: is safe to launch (does not eject hazardous debris or detonate upon ignition), safely separates from the launch point/tube, and travels at and explosively functions at trajectories which cause no additional hazards to the firing crew.

a. The data acquired during free flight firing should be sufficient to support weapon danger area analysis and to capture any performance data that may be related to safety.

b. Acoustic noise, blast overpressure, launch blast debris, toxic gases, thermal effects, radiance, and launcher reaction data are potential health hazards that may cause harm to the launch crew. Other system specific health hazards should be considered (see Annex H, Appendix 2).

1.2 Fuze Arming Distance Firing (Annex D, Appendix 1, Paragraph 2).

These tests are used in combination with warhead arena trials to verify that the no-arm or “minimum arm distance” exceeds the safe separation distance for the item. The safe separation distance is defined as the minimum distance between personnel operating the weapon and the launched munition beyond which the hazards to the personnel resulting from the functioning of the munition are acceptable. Detailed guidance may be found in the AOP-20, Manual of Tests for the Safety Qualification of Fuzing Systems. The test munitions are launched at hot and cold temperatures on munitions that have completed sequential environmental testing in order to identify any unacceptable fuze performance variations resulting from thermal and mechanical degradation. Tests have shown that fuze performance is highly temperature sensitive, thus, a large distribution of the distance at which the warhead functions may result. Although the quantities specified in Annex B are considered a statistically small sample size, exposure of the munitions to the sequential environmental tests prior to firing increases the degree of confidence

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 2. OPERATING TESTS.

in the munition. Note that data from this test are also used to determine range safety parameters (i.e., weapon danger area or "Safety Fan"). The specific test procedure to be conducted is dependent on the type of fuzing system.

a. The Projectile Fuze Arming Distance is used to determine the minimum arm distance for point detonating and delay type fuzing systems. The minimum arming distance is verified by arranging targets at varying distances and determining statistically the no arm distance based on the number of detonations at the various distances. Multiple test methods are described in AOP-20; the specific method selection should be based on the specific test requirements.

b. For an air burst type fuzing system, minimum arm determination by the Time to Air Burst test approach is used (AOP-20 Test D3). The fuze must be preset to function at a predetermined time or distance. An impact sensor is not involved and configuration modification is complicated by designs that typically preclude any type of pre-triggering for safety purposes. The determination of fuze function time from firing may include a variety of time measurement and fuze function/burst detection systems depending on the required accuracy and precision as described in AOP-20 Test D3.

c. For multi-role fuze systems, sample size should be divided between the various modes and consideration should be given toward increasing the sample size if required to maintain an acceptable level of confidence. External evidence may be gathered from component level fuze tests in order to provide additional confidence in the fuze performance.

1.3 Fire from Enclosure (Annex D, Appendix 1, Paragraph 3).

This is a special case of the free flight firing test in which munitions are fired out of specially designed rooms or enclosures. The test provides data to allow the subsequent assessment of the minimum size room from which a weapon may be fired without harming the occupants of the room. Most shoulder launched munitions will require this test. Review weapon operational scenarios to determine its applicability. For further guidance, refer to ITOP 05-2-517.

2. COMPONENT LEVEL TESTS (ANNEX D, APPENDIX 2).

2.1 Rocket Motor Tests.

Static firing and case burst tests are performed to determine the probability of catastrophic motor case rupture during firing operations. All munitions must have been subjected to extreme environmental stresses, such that the characteristic variation of the rocket motor pressure data can be obtained during the static firing and burst tests.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 2. OPERATING TESTS.

2.1.1 Static Firing (Annex D, Appendix 2, Paragraph 2.1).

These tests are performed to measure maximum internal operating pressures and provide data to determine any changes of motor burn performance that may result from environmental exposure. To induce the maximum operating pressure, and to assess thermal liner/bond line integrity, the rocket motors are static fired under both high and low temperature conditions. The high temperature tests should be conducted at 63 ºC or the unpackaged SRE temperature. The cold temperature tests should be conducted at -46 ºC. Although these values may be more severe than the manufacturers recommended upper and lower firing temperatures for munition performance, the extreme values should be used to assess safety aspects of the motor firing under worst case service conditions. Appropriate precautions should be taken if the firing temperature exceeds the manufacturer recommendations.

2.1.2 Burst (Annex D, Appendix 2, Paragraph 2.2).

These tests are performed to measure the internal pressure required to burst the rocket motor. Characterization of the effects of the bursting motor is a secondary objective. Hydrostatic burst testing is the most commonly used test method and may be conducted with or without propellant. However, it is strongly recommended that the tests be performed with the propellant loaded in the case, in order to maintain case integrity. Test results could be affected if the case is damaged during the propellant removal process. Dynamic burst testing using a modified or choked nozzle is an acceptable method if the results are repeatable. Either test method must produce pressurization rates approximately the same as a normally fired motor. Burst test studies have shown that the burst pressure values are influenced by the pressurization rate, the condition of the motor case, and the motor case material. In this case, it is the pressurization rate which can be controlled by the tester. Thus, the pressure must change rapidly in order to obtain burst pressure data, which is representative of the motor population.

2.2 Other Pressure Vessels (Annex D, Appendix 2, Paragraph 2.3).

Appropriate burst tests should be conducted on any other pressure vessel in the AUR.

2.3 Warhead Arena Trials (Annex H, Appendix 4, Paragraph 1).

The safe separation distance is determined by the warhead fragment characteristics (size, mass, velocity, and spatial dispersion). A sample size of at least four is required because only a portion of the total number of fragments produced is collected in the recovery medium. The sample size must be large enough to reliably evaluate fragmentation characteristics in order to determine the average fragmentation spatial dispersion. Note that data from this test are also used to determine range safety parameters (i.e., weapon danger area or "Safety Fan").

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 2. OPERATING TESTS.

2.4 Other Energetics (Annex D, Appendix 2, Paragraph 4).

Appropriate functional testing should be conducted on any other energetic in the AUR.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 3. NON-SEQUENTIAL SAFETY TESTS.

1. ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E3) ASSESSMENT AND TESTING (ANNEX H, APPENDIX 1).

1.1 HERO (Annex H, Appendix 1, Paragraph 1).

This test, also known as Electromagnetic Radiation Hazards (EMRH) testing, assesses the safety of the weapon Electrically Initiated Devices (EIDs also known as Electroexplosive Devices ((EED's)) or Electronic Safe and Arming Devices (ESAD's), and associated firing circuits when exposed to electromagnetic environments such as those which may be encountered during the ordnance system stockpile to safe separation sequence (transportation/storage, assembly/disassembly, staged, loading/unloading, platform-loaded, and immediate post-launch). Levels should encompass sea, land, and aviation storage, usage, and shipment requirements.

1.2 ESD (Annex H, Appendix 1, Paragraph 2).

These tests assess the safety of the weapon when exposed to ESD phenomenon such as those encountered during handling and helicopter transport. Test asset quantities are based on AOP20.

1.3 Lightning Hazard (Annex H, Appendix 1, Paragraph 3).

These tests assess the safety of the weapon when exposed to near and direct strike lightning, which may occur during logistic and field operations.

2. HEALTH HAZARDS (ANNEX H, APPENDIX 2).

Health hazard data are to be collected during the AUR Level Firing Tests (see Annex D, Appendix 2). The hazards to be assessed for shoulder launched munitions are described below.

2.1 Acoustic Energy (Impulse Noise and Blast Overpressure) (Annex H, Appendix 2, Paragraph 1).

The weapon firing precipitates the sudden release of gases into the surrounding air, causing a shock wave or front to be propagated outward from the source. Firing tests are performed to measure blast overpressure and acoustic noise to determine if the shock wave damages structures and/or injures personnel. Further information may be found in International Standard ISO 10843: 1997 Acoustics – Methods, for the description and physical measurement of single impulses or series of impulses.

ANNEX A. BACKGROUND/RATIONALE.

APPENDIX 3. NON-SEQUENTIAL SAFETY TESTS.

2.2 Toxic Chemical Substances (Annex H, Appendix 2, Paragraph 2).

Rocket exhaust gases contain toxic chemical_substances such as CO, CO_2, SO_2, NO, NO_2, and HCl. Other harmful chemicals should be considered if determined to potentially harmful to the operator. These hazards shall be evaluated with respect to the envisaged operational environment and on the basis of pertinent national laws and regulations.

2.3 Radiating Energy (Annex H, Appendix 2, Paragraph 3).

Weapon firings may subject the operator to extreme heat and light exposure. The propulsion unit radiance may produce permanent or temporary (i.e. flash blindness) eye damage. Exposure to heat during munition launch may cause eye and skin damage.

2.4 Shock (Annex H, Appendix 2, Paragraph 4).

Shock levels due to weapon firing and recoil may injure the operator. The probability of injury increases with the blast energy of the weapon, proximity of the operator to the weapon, and the duration of the shock environment.

2.5 Oxygen Starvation (Annex H, Appendix 2, Paragraph 6).

Oxygen starvation can occur when munitions are fired from a confined space or enclosure. This measurement is specific to ‘fire from enclosure’.

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ANNEX B. S3 TEST PROGRAM.

This Annex provides the overall S3 test programs for the analytical and empirical S3 test approaches in Appendix 1 and 2, respectively. Each S3 test program is presented in the form of test flowcharts, munition allocation tables, and test asset quantities tables. It should be noted that several non-sequential test requirements (i.e. hazard classification and insensitive munitions tests) are considered part of the overall S3 program, but are not governed by this document. For these tests, references are provided for determination of test requirements and quantities. In addition, a specific tailoring example is provided in Appendix 3 for the purpose of illustrating how S3 test program requirements may be reduced given specific circumstances related to the munition under test.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

S3 assessment testing of shoulder launched munitions requires a series of sequential environmental tests, operating/firing tests, and non-sequential (stand alone) environmental tests. The overall munition quantities for the sequential and non-sequential tests are provided in Tables B1-1 and B1-2, respectively. The analytical S3 test program is illustrated in the form of test flow charts in Figures B1-1 and B1-2, coupled with the munition allocation tables in Tables B1-3 and B1-4, which provide the test flow for each individual munition.

1. SAMPLE QUANTITIES FOR SEQUENTIAL ENVIRONMENTAL TESTS USING THE ANALYTICAL S3 TEST APPROACH.

A total of 52 live munitions are to be subjected to sequential environmental tests. Upon completion of the environmental tests, the 52 munitions are divided into three groups and tested further as follows:

a. Twenty AURs are dynamically fired from unmanned launch stations.

b. Eight munitions are subjected to BTCA.

c. Twenty four munitions are disassembled for component level testing. The following component level tests will be required:

(1) Twelve rocket motors are statically fired.

(2) Twelve rocket motors are hydrostatically or dynamically burst tested.

(3) Any other pressure vessel (excluding rocket motor cases) which may cause serious personnel hazards must be burst tested. A minimum of twelve of each type are required to determine the safety design margin.

(4) Any other energetic devices (e.g. igniters, initiators, squibs, pyrotechnics, thermal batteries, etc.), which may cause serious personnel hazards at the system level must be static fired. A minimum of ten of each type are required to determine the safety design margin.

2. SAMPLE QUANTITIES FOR NON-SEQUENTIAL SAFETY TESTS USING THE ANALYTICAL S3 TEST APPROACH.

A total of 64 test assets including four live munitions, three inert munitions, four warheads, up to 51 sets of EID/ESAD’s, and additional munitions and/or munition components for Operational and Maintenance, Hazard Classification, and Insensitive Munitions testing will be required for the following non-sequential safety tests:

a. Three live munitions for Logistic Drop.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

b. One live and three inert munitions for use with 51 each EID/ESADs required for E3 assessment tests. Instrumented components may be substituted where actual measurement of the maximum no-fire stimulus may be obtained. Systems or subsystems incorporating ESAD's must be tested while in the functional mode. At a minimum, E3 assessment tests will include the following:

(1) One live munition and one inert munition with 20 live sets of EID/ESAD's for Lightning Hazard.

(2) One inert munition (no fill/energetics) capable of disassembly/reassembly without damage with one instrumented EID/ESAD empty-inert with bridge intact and exposed for HERO Tests.

(3) One inert munition with 30 live sets of EID/ESAD's for ESD Tests (20 for personnel and 10 for helicopter-borne ESD).

c. Additional inert munitions may be required for Operational and Maintenance Review as described in Annex H, Appendix 3.

d. Additional live munitions will be required for Hazard Classification Testing per STANAG 4123 and AASTP-3.

e. Additional live munitions will be required for Insensitive Munitions Tests per STANAG 4439 and AOP-39.

f. Systems or subsystems incorporating firing circuits controlled by electronics must be tested while in the functional mode if the threat is present when they are powered.

g. Four modified munitions are subjected to warhead arena trials.

h. Additional test assets may be required for fuze S3 testing per STANAGs 4187 and 4157, and AOP-20.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

TABLE B1-1. ENVIRONMENTAL TEST ASSET QUANTITIES FOR THE ANALYTICAL S3 TEST APPROACH

ENVIRONMENTAL TESTS	LIVE MUNITIONS	INERT MUNITIONS	OTHER UNITS OR COMPONENTS
Climatic, Shock & Vibration	52	---	---
Logistic Drop Test	3	---	---
Electromagnetic Radiation Operation Hazards (EMROH)/HERO	---	1	1 ea EID/ESAD
ESD	---	1	30 ea EID/ESAD
Lightning Hazard	1	1	20 ea EID/ESAD
Totals	56	3	51

TABLE B1-2. OPERATING TEST ASSET QUANTITIES FOR THE ANALYTICAL S3 TEST APPROACH

TESTS (SEQUENTIAL ENVIRONMENTAL TEST ASSETS)	LIVE MUNITIONS	PROPULSION UNITS/ OTHER PRESSURE VESSELS	WARHEADS/OTHER ENERGETIC COMPONENTS
AUR Level Operating Tests			
AUR Dynamic Firings	20	---	---
Component Level Operating Tests			
Static Firings	---	12 ea	10 ea
Burst (Dynamic or Hydrostatic)	---	12 ea	---
Warhead Arena Trials	---	---	4 ea
BTCA	8	---	---
Operational and Maintenance	28	24	TBD

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

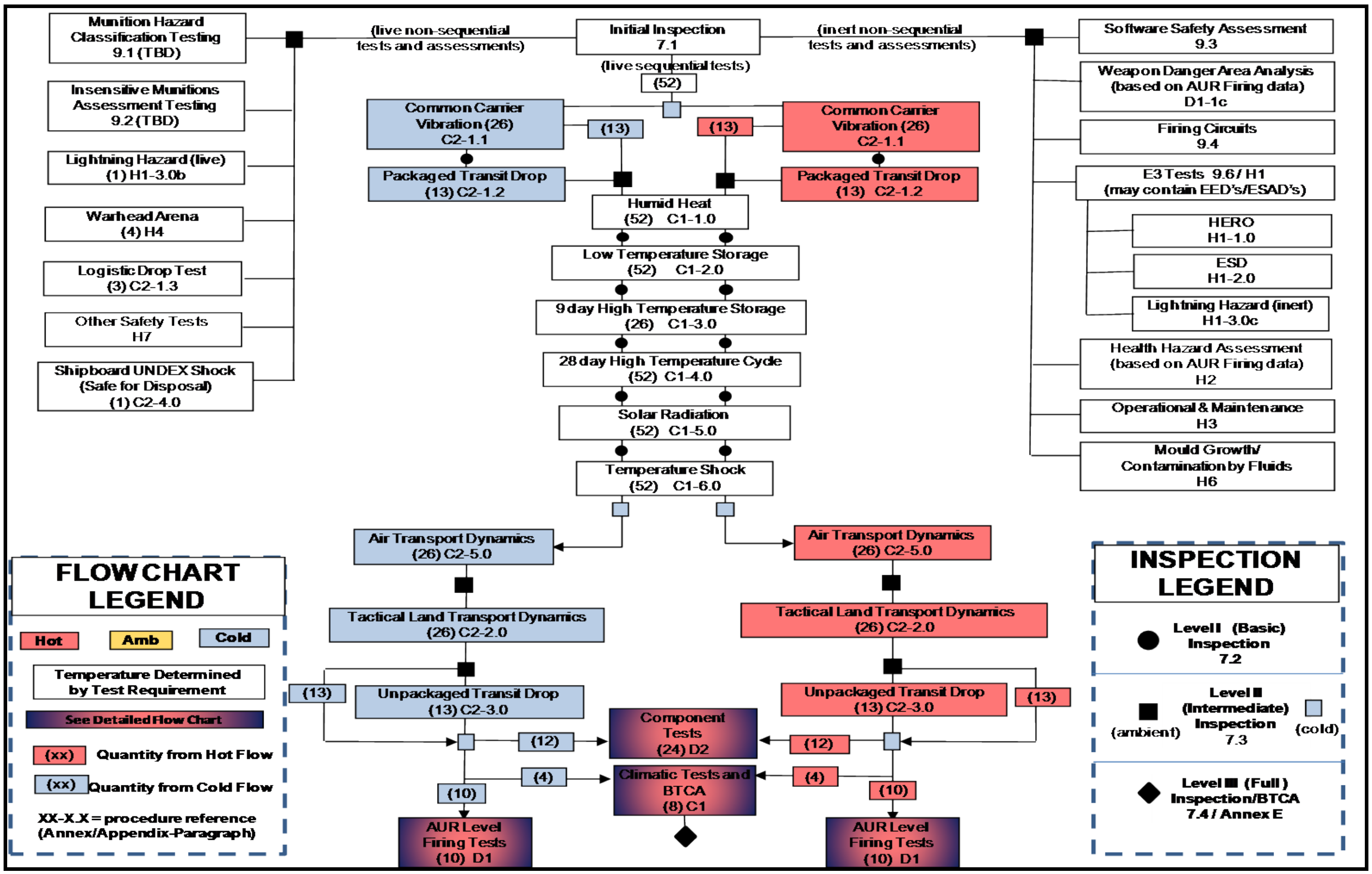

Figure B1-1. Analytical S3 Test Flow Charts for Shoulder Launched Munitions.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

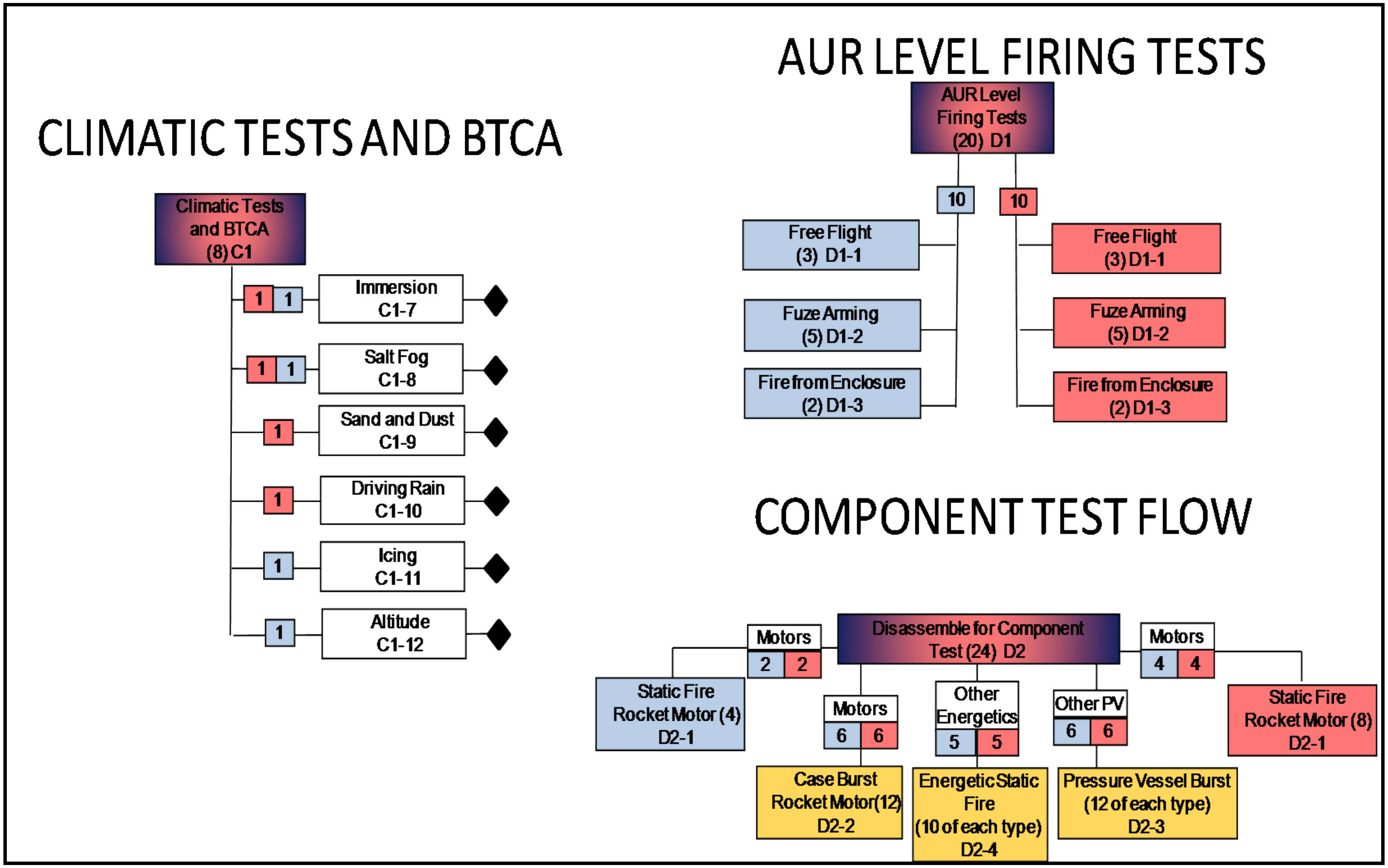

Figure B1-2. Analytical S3 Test Flow Charts for Shoulder Launched Munitions.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

TABLE B1-3. SEQUENTIAL TESTS - HOT TEST STREAM (ANALYTICAL S3 TEST APPROACH)

Test serial	Annex/App/Para	Munition number																									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Test Asset Configuration																											
Tactical Seeker											x			x						x							
Tactical Warhead		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Propulstion Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Guidance and Control System											x			x						x							
Initial Baseline Inspection	7.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Common carrier vibration (packaged)	C/2/1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	h	h	h	h	h	h	h	h	h	h	h	h	h													
Level II Inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Humid heat (10 cycles)	C/1/1.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Parachute drop shock - low velocity (packaged)	C/2/5.3		h		h		h		h		h		h		h		h		h		h		h		h		h
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Restrained cargo shock (unpackaged)	C/2/2.3	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Loose cargo (packaged)	C/2/2.1.2	h	h			h	h			h	h			h	h			h	h			h	h			h	h
Loose cargo (unpackaged)	C/2/2.1.2			h	h			h	h			h	h			h	h			h	h			h	h		
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	h		h		h		h		h		h		h		h		h		h		h		h		h	
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Immersion	C/1/7.0	x																									
Salt fog	C/1/8.0		x																								
Sand & dust	C/1/9.0			x																							
Rain/Watertightness	C/1/10.0				x																						
Icing	C/1/11.0																										
Altitude	C/1/12.0																										
Level III Inspection (BTCA)	7.4	a	a	a	a																						
Free Flight Firing	D/1/1										h			h						h							
Fuze Arming	D/1/2											h									h	h	h	h			
Fire From Enclosure	D/1/3												h												h		
Static RM firing (UFT & LFT)	D/2/1					h	c	c	h						h	h											
RM burst integrity (hydraulic)	D/2/2									a							a	a	a							a	a
Other Pressure Vessel burst integrity	D/2/3									a							a	a	a							a	a
Other energetic static fire	D/2/4					a	a	a							a	a											

key:	
a	ambient
h	hot
c	cold
x	required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 1. S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

TABLE B1-4. SEQUENTIAL TESTS - COLD TEST STREAM (ANALYTICAL S3 TEST APPROACH)

		Munition number																									
Test serial	Annex/App/Para	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Test Asset Configuration																											
Tactical Seeker											x			x						x							
Tactical Warhead		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Propulstion Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Guidance and Control System											x			x						x							
Initial Baseline Inspection	7.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Common carrier vibration (packaged)	C/2/1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	c	c	c	c	c	c	c	c	c	c	c	c	c													
Level II Inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Humid heat (10 cycles)	C/1/1.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I Inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Parachute drop shock - low velocity (packaged)	C/2/5.3		c		c		c		c		c		c		c		c		c		c		c		c		c
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Restrained cargo shock (unpackaged)	C/2/2.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Loose cargo (packaged)	C/2/2.1.2	c	c			c	c			c	c			c	c			c	c			c	c			c	c
Loose cargo (unpackaged)	C/2/2.1.2			c	c			c	c			c	c			c	c			c	c			c	c		
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	c		c		c		c		c		c		c		c		c		c		c		c		c	
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Immersion	C/1/7.0	x																									
Salt fog	C/1/8.0		x																								
Sand & dust	C/1/9.0																										
Rain/Watertightness	C/1/10.0																										
Icing	C/1/11.0			x																							
Altitude	C/1/12.0				x																						
Level III Inspection (BTCA)	7.4	a	a	a	a																						
Free Flight Firing	D/1/1										c			c						c							
Fuze Arming	D/1/2											c									c	c	c	c			
Fire From Enclosure	D/1/3												c												c		
Static RM firing (UFT & LFT)	D/2/1					h	c	c	h						h	h											
RM burst integrity (hydraulic)	D/2/2									a							a	a	a							a	a
Other Pressure Vessel burst integrity	D/2/3									a							a	a	a							a	a
Other energetic static fire	D/2/4					a	a	a							a	a											

key:	
a	ambient
h	hot
c	cold
x	required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

S3 assessment testing of shoulder launched munitions requires a series of sequential environmental tests, operating/firing tests, and non-sequential (stand alone) environmental tests. The overall munition quantities for the sequential and non-sequential tests are provided in Tables B2-1 and B2-2, respectively. The Empirical S3 Test Program is illustrated in the form of test flow charts in Figures B2-1 and B2-2 coupled with the munition allocation tables in Tables B2-3 and B2-4, which provide the sequential environmental test flow for each individual munition.

1. SAMPLE QUANTITIES FOR SEQUENTIAL ENVIRONMENTAL TESTS USING THE EMPIRICAL S3 TEST APPROACH.

A total of 120 AURs are to be subjected to sequential environmental tests. Upon completion of the environmental tests, the 120 AURs are divided into two groups and tested further as follows:

a. One-hundred and twelve (112) AURs are fired from unmanned launch stations.

b. Eight AURs are subjected to BTCA.

2. SAMPLE QUANTITIES FOR NON-SEQUENTIAL TESTS USING THE EMPIRICAL S3 TEST APPROACH.

A minimum of 61 test assets including 3 live munitions, 3 inert munitions, 6 warheads, and 51 sets of EID/ESAD’s will be required for the following non-sequential safety tests:

a. Three live munitions for Logistic Drop.

b. Three inert munitions for use with 51 ea EID/ESADs required for E3 assessment tests. Instrumented components may be substituted where actual measurement of the maximum no-fire stimulus may be obtained. Systems or subsystems incorporating ESAD's must be tested while in the functional mode. At a minimum, E3 assessment tests will include the following:

(1) One live munition and one inert munition with 20 live sets of EID/ESAD’s for Lightning Hazard.

(2) One inert munition with one instrumented EID/ESAD for HERO Tests.

(3) One inert munition with 30 live sets of EID/ESAD’s for ESD Tests.

c. Additional inert munitions may be required for Operational and Maintenance Review as described in Annex H, Appendix 3.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

d. Additional munitions will be required for Hazard Classification Testing per STANAG 4123 and AASTP-3.

e. Additional munitions will be required for Insensitive Munitions Tests per STANAG 4439 and AOP-39.

f. Six modified munitions will be required for Warhead Arena Trials.

TABLE B2-1. ENVIRONMENTAL TEST ASSET QUANTITIES FOR THE EMPIRICAL S3 TEST PROGRAM

ENVIRONMENTAL TESTS	LIVE MUNITIONS	INERT MUNITIONS	OTHER UNITS OR COMPONENTS
Climatic, Shock & Vibration	120	---	---
Logistic Drop Test	3	---	---
EMROH/HERO	---	1	1 ea EID/ESAD
ESD	---	1	30 ea EID/ESAD
Lightning Hazard	1	1	20 ea EID/ESAD
Totals	124	3	51

TABLE B2-2. OPERATING TEST ASSET QUANTITIES FOR THE EMPIRICAL S3 TEST PROGRAM

TESTS (SEQUENTIAL ENVIRONMENTAL TEST ASSETS)	LIVE MUNITIONS	WARHEADS
AUR Level Operating Tests		
AUR Dynamic Firings	112	---
Component Level Operating Tests		
Warhead Arena Trials	---	6
BTCA	8	---
Operational and Maintenance	120	6

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

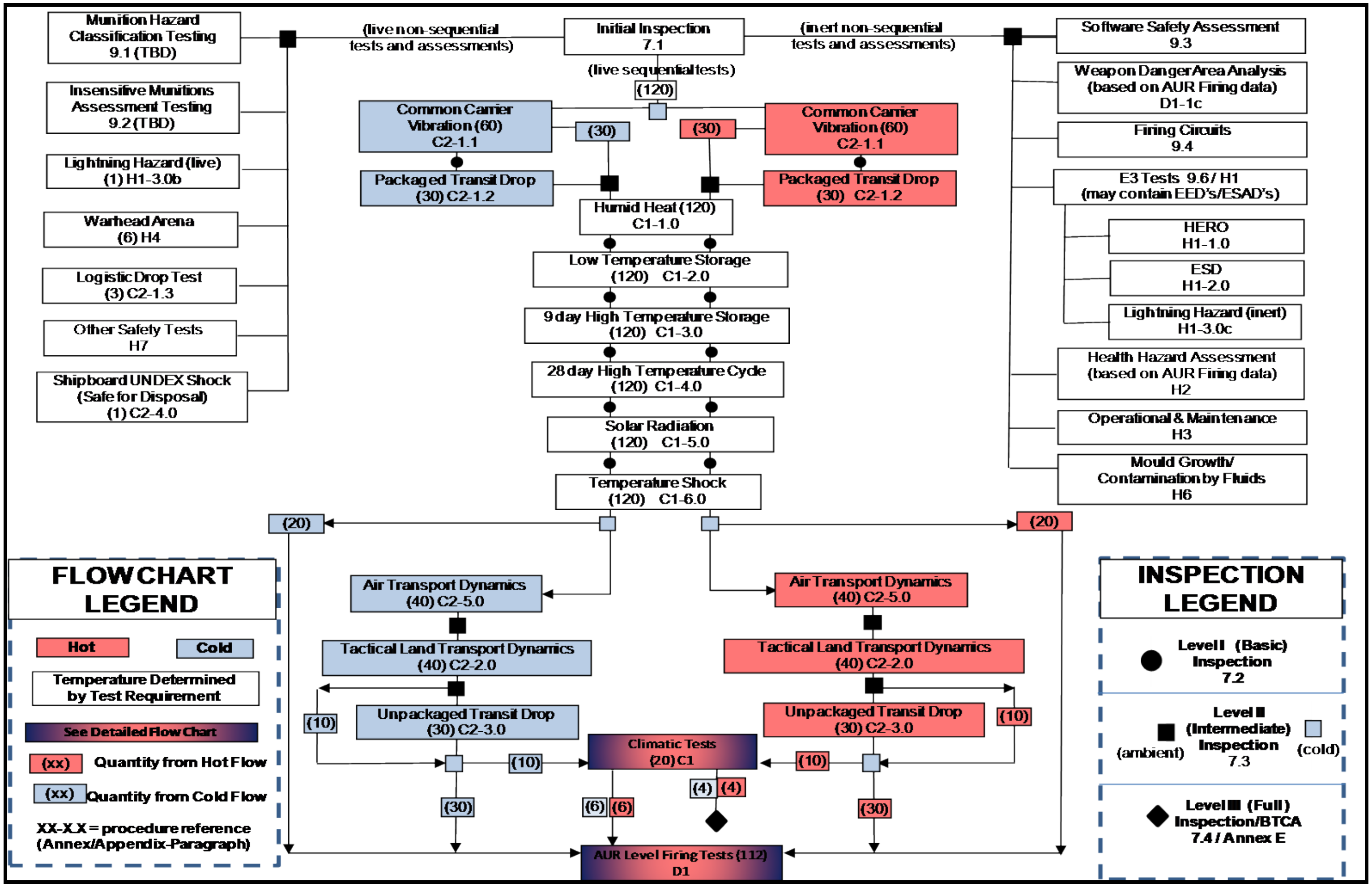

Figure B2-1. Empirical S3 Test Flow Chart for Shoulder Launched Munitions.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

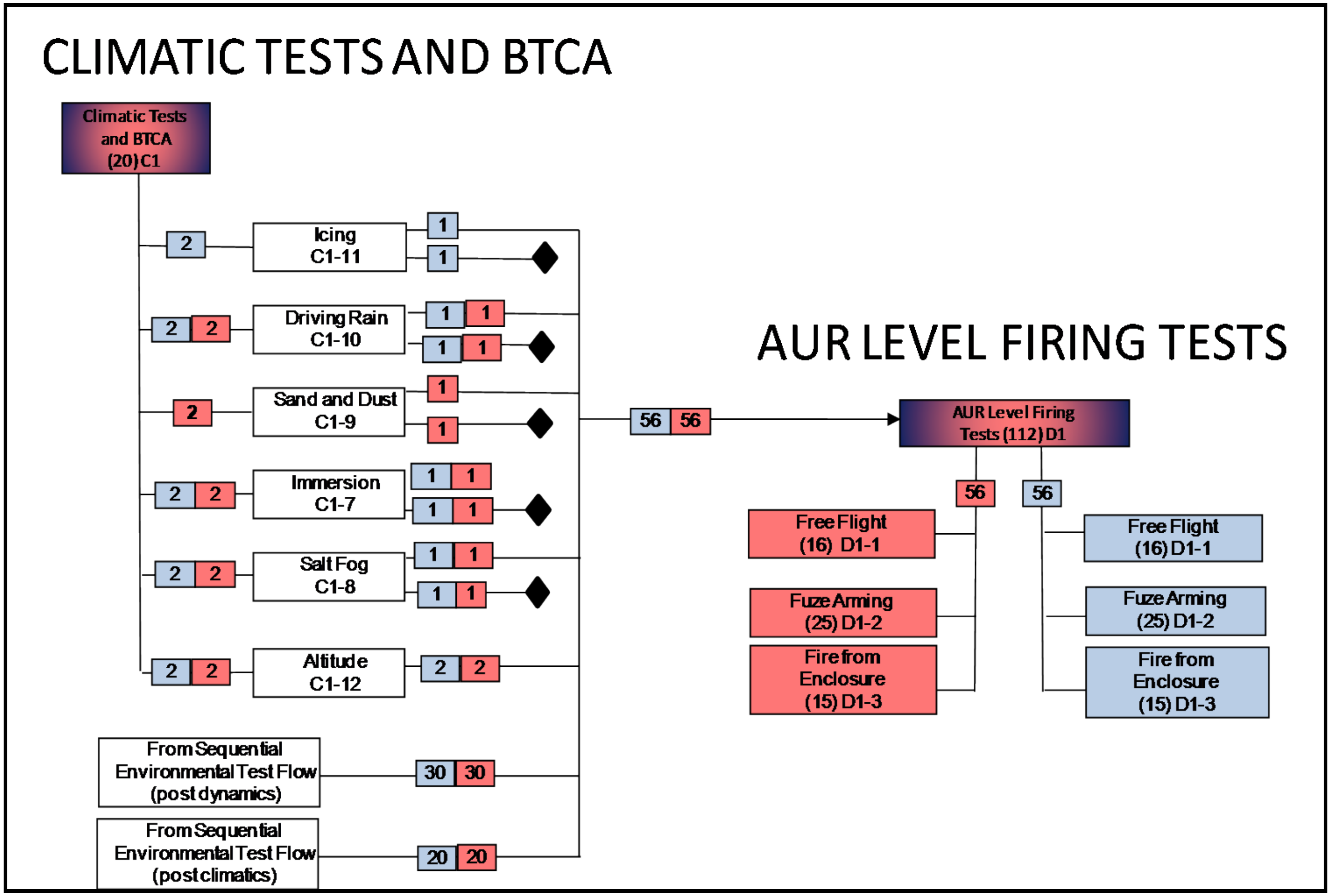

Figure B2-2. Empirical S3 Test Flow Chart for Shoulder Launched Munitions.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

TABLE B2-3. SEQUENTIAL TESTS - HOT TEST STREAM (EMPIRICAL S3 TEST APPROACH)

		Munition number																																										
	Annex/App/Para	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41-45	46-50	51-60
Test Asset Configuration																																												
Tactical Seeker		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Warhead		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Propulstion Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Guidance and Control System		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Initial Baseline Inspection	7.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Common carrier vibration (packaged)	C/2/1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h																h	h	h	h	h	h	h	h	h	h	h		
Level II inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Humid heat (10 cycles)	C/1/1.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Parachute drop shock - low velocity (packaged)	C/2/5.3	h		h		h		h		h		h		h		h		h		h		h		h		h		h		h		h		h		h		h		h				
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Restrained cargo shock (unpackaged)	C/2/2.3	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h			
Loose cargo (packaged)	C/2/2.1.2	h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h					
Loose cargo (unpackaged)	C/2/2.1.2			h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h			h	h			
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h						h	h	h	h	h								
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Immersion	C/1/7.0	x															x																											
Salt fog	C/1/8.0		x															x																										
Sand & dust	C/1/9.0			x															x																									
Rain/Watertightness	C/1/10.0				x															x																								
Icing	C/1/11.0					x															x																							
Altitude	C/1/12.0						x															x																						
Level III Inspection (BTCA)	7.4	a	a	a	a																																							
Free Flight Firing	D/1/1					h	h	h				h	h							h	h	h	h	h										h								h		
Fuze Arming	D/1/2													h	h	h	h											h	h	h	h				h	h	h	h	h	h	h			h
Fire From Enclosure	D/1/3								h	h	h							h	h						h	h	h					h	h										h	

key: a ambient h hot c cold x required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 2. EMPIRICAL S3 TEST PROGRAM FOR SHOULDER LAUNCHED MUNITIONS.

TABLE B2-4. SEQUENTIAL TESTS - COLD TEST STREAM (EMPIRICAL S3 TEST APPROACH)

		Munition number																																									
	Annex/App/Para	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101-105	106-110	111-120
Test Asset Configuration																																												
Tactical Seeker		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Warhead		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Propulstion Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Guidance and Control System		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Initial Baseline Inspection	7.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Common carrier vibration (packaged)	C/2/1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c																c	c	c	c	c	c	c	c	c	c	c		
Level II inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Humid heat (10 cycles)	C/1/1.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Parachute drop shock - low velocity (packaged)	C/2/5.3	c		c		c		c		c		c		c		c		c		c		c		c		c		c		c		c		c		c		c		c				
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Restrained cargo shock (unpackaged)	C/2/2.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c			
Loose cargo (packaged)	C/2/2.1.2	c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c					
Loose cargo (unpackaged)	C/2/2.1.2			c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c			c	c			
Level II inspection (BIT, visual, NDT, radiography)	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c						c	c	c	c	c								
Level II inspection (BIT, visual, NDT, radiography)	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Immersion	C/1/7.0	x															x																											
Salt fog	C/1/8.0		x															x																										
Sand & dust	C/1/9.0			x															x																									
Rain/Watertightness	C/1/10.0				x															x																								
Icing	C/1/11.0					x															x																							
Altitude	C/1/12.0						x															x																						
Level III Inspection (BTCA)	7.4	a	a	a	a																																							
Free Flight Firing	D/1/1					c	c	c				c	c							c	c	c	c	c										c								c		
Fuze Arming	D/1/2													c	c	c	c											c	c	c	c				c	c	c	c	c	c	c			c
Fire From Enclosure	D/1/3								c	c	c							c	c						c	c	c					c	c										c	

key: a ambient h hot c cold x required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

1. INTRODUCTION.

The text below gives a worked example showing how the test quantities can be tailored given a specific set of circumstances. It is not to be used as the definitive test quantities set or as a substitute for those quantities provided in Annex B. As stated in paragraph 6.3, deviations from the S3 assessment testing program shall be approved by National S3 Authority(ies) or other appropriate Authorities prior to the start of testing.

2. TEST QUANTITIES TAILORING - WORKED EXAMPLE.

2.1 Example System Description.

For the purposes of this example, an S3 test program is to be conducted for a previously fielded system with a new propulsion unit. The modifications include new propellant charge weight and new igniter, but structural and sealing components remain unchanged. Warhead, guidance, and seeker systems are unchanged, as is the anticipated user environment. The warhead safe and arm/fuze component(s) have been qualified (or has a favourable S3 assessment) in accordance with AOP-20.

2.2 Tailoring of Test Asset Configuration.

2.2.1 Non-tactical components. The test assets may include inert warhead and other non-tactical components if those components have previously completed S3 testing, with the exception that fully functional guidance and control systems will be required for the AUR Dynamic Firing test assets. Any non-tactical mass simulants are required to have thermal, structural, and dynamic characteristics similar to the tactical hardware.

2.3 Sequential Environmental Trial and Operation Test Tailoring Considerations.

2.3.1 Reduction in Climatic Test Requirements.

Immersion, Salt Fog, Sand and Dust, Rain/Watertightness, Icing, and Altitude tests may be eliminated since no changes to the weapon seals have been made.

ANNEX B. S3 TEST PROGRAM.

APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

2.3.2 Reduction in BTCA Test Requirements.

BTCA is an underpinning principle of S3 testing and analysis since this provides significant information in respect to residual safety margins. Furthermore, BTCA data obtained as part of a S3 program can also form the body of evidence to be used during subsequent In-Service Surveillance activities. Additionally, some Nations place greater emphasis on the results of BTCA than other tests. For these reasons this cannot be eliminated from any S3 program, but there is rationale for reducing the quantity from 8 to 4 based on confidence from prior field experience. Four assets is the minimum for this example in order to provide adequate material for the required AOP-7 testing. Furthermore, BTCA is only required for the new components (rocket motor and igniter).

2.3.3 Elimination of Static Firing Test for Warhead and Other Energetic Components.

These firings may be eliminated since the warhead and other energetic are unchanged.

2.3.4 Reduction in AUR Dynamic Firing Test Requirements.

AUR Free Flight Firings and Firing From Enclosure Tests should not be eliminated, but the quantities may be reduced based on confidence from prior field experience, developmental tests, and static firing data. Minimum quantities for this example are two hot/two cold for AUR Free Flight Firing and one hot/one cold for Fire From Enclosure. The fuze system firings may be eliminated since the fuze is unchanged.

2.3.5 Elimination of Rocket Motor Case and Other Pressure Vessel Burst Integrity Test Requirements.

These tests may be eliminated if there is no material change to the pressure vessel or structural components of the propulsion unit, and prior S3 showed has shown no material degradation and a substantial safety margin. Burst integrity will be further assessed based on static firing data. Other pressure vessels are unchanged, thus testing of these components may be eliminated.

2.4 Non-Sequential Test Tailoring Considerations.

2.4.1 Reduction in 12 m Logistic Safety Drop Test Asset Quantity.

Since the full system has been previously qualified, only one missile with live propulsion unit (non-tactical warhead, guidance and seeker) is required. This drop needs to be in the worst case orientation for the propulsion unit.

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APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

2.4.2 Elimination of Fluid Contamination and Mould Growth Test Requirements.

These tests may be eliminated since no changes to the structural components or weapon seals have been made.

3. TAILORED TEST PROGRAM.

a. Based on the preceding discussion, the following test assets may be reduced from the Analytical S3 Test Flow:

(1) Ten (10) each Fuze Arming Firing.

(2) Two (2) each Fire From Enclosure.

(3) Twelve (12) each Rocket Motor Burst Integrity and Other Pressure Vessel Burst Integrity.

(4) Two (2) each Free Flight Firing.

(5) Four (4) each BTCA requirements.

b. This effectively removes 30 munitions from the 52 munition sequential test program as shown in Tables B3-1 and B3-2, leaving just 22 weapons as shown in Table B3-3. Additionally, the number of weapons required for Logistic Drop Testing is reduced from three to one and further reductions may be achieved for Insensitive Muntions, Hazard Classification, and E3 tests.

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APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

TABLE B3-1. TAILORED SEQUENTIAL TESTS - HOT TEST STREAM (ANALYTICAL S3 TEST FLOW).

	Annex/App/Para	Munition number																									
Test Asset Configuration		1	2	~~3~~	~~4~~	5	6	7	8	~~9~~	10	~~11~~	12	~~13~~	14	15	~~16~~	~~17~~	~~18~~	19	~~20~~	~~21~~	~~22~~	~~23~~	~~24~~	~~25~~	~~26~~
Tactical Seeker				/	/					/	x	/		~~x~~			/	/	/	x	/	/	/	/	/	/	/
~~Tactical Warhead~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~
Tactical Propulsion Unit		x	x	~~x~~	~~x~~	x	x	x	x	~~x~~	x	~~x~~	x	~~x~~	x	x	~~x~~	~~x~~	~~x~~	x	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~
Tactical Guidance and Control System				/	/					/	x	/		~~x~~			/	/	/	x	/	/	/	/	/	/	/
Initial Baseline Inspection	7.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Common carrier vibration (packaged)	C/2/1.1	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~			/	/	/		/	/	/	/	/	/	/
Level II inspection	7.3	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Humid heat (10 cycles)	C/1/1.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level II inspection	7.3	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Parachute drop shock - low velocity (packaged)	C/2/5.3		h	/	~~h~~		h		h	/	h	/	h	/	h		~~h~~	/	~~h~~		~~h~~	/	~~h~~	/	~~h~~	/	~~h~~
Level II inspection	7.3	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Restrained cargo shock (unpackaged)	C/2/2.3	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Loose cargo (packaged)	C/2/2.1.2	h	h	/	/	h	h			~~h~~	h	/		~~h~~	h		/	~~h~~	~~h~~		/	~~h~~	~~h~~	/	/	~~h~~	~~h~~
Loose cargo (unpackaged)	C/2/2.1.2			~~h~~	~~h~~			h	h	/		~~h~~	h	/		h	~~h~~	/	/	h	~~h~~	/	/	~~h~~	~~h~~	/	/
Level II inspection	7.3	a		~~a~~	~~a~~	a		a		/		/		/		a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	h		~~h~~	/	h		h		~~h~~		~~h~~		~~h~~		h	/	~~h~~	/	h	/	~~h~~	/	~~h~~	/	~~h~~	/
Level II inspection	7.3	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
~~Immersion~~	C/1/7.0	~~x~~		/	/					/		/		/			/	/	/		/	/	/	/	/	/	/
~~Salt fog~~	C/1/8.0		~~x~~	/	/					/		/		/			/	/	/		/	/	/	/	/	/	/
~~Sand & dust~~	C/1/9.0			~~x~~	/					/		/		/			/	/	/		/	/	/	/	/	/	/
~~Rain/Watertightness~~	C/1/10.0			/	~~x~~					/		/		/			/	/	/		/	/	/	/	/	/	/
~~Icing~~	C/1/11.0			/	/					/		/		/			/	/	/		/	/	/	/	/	/	/
~~Altitude~~	C/1/12.0			/	/					/		/		/			/	/	/		/	/	/	/	/	/	/
Level III Inspection (BTCA)	7.4	a	a	~~a~~	~~a~~					/		/		/			/	/	/		/	/	/	/	/	/	/
Free Flight Firing	D/1/1			/	/					/	h	/		~~h~~			/	/	/	h	/	/	/	/	/	/	/
~~Fuze Arming~~	D/1/2			/	/					/		~~h~~		/			/	/	/		~~h~~	~~h~~	~~h~~	~~h~~	/	/	/
Fire From Enclosure	D/1/3			/	/					/		/	h	/			/	/	/		/	/	/	/	~~h~~	/	/
Static RM firing (UFT & LFT)	D/2/1			/	/	h	c	c	h	/		/		/	h	h	/	/	/		/	/	/	/	/	/	/
Other energetic static fire	D/2/4			/	/	a	a	a		/		/		/	a	a	/	/	/		/	/	/	/	/	/	/
~~RM burst integrity (hydraulic)~~	D/2/2			/	/					~~a~~		/		/			~~a~~	~~a~~	~~a~~		/	/	/	/	/	~~a~~	~~a~~
~~Other Pressure Vessel burst integrity~~	D/2/3			/	/					~~a~~		/		/			~~a~~	~~a~~	~~a~~		/	/	/	/	/	~~a~~	~~a~~

key:	
a	ambient
h	hot
c	cold
x	required
/	not required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

TABLE B3-2. TAILORED SEQUENTIAL TESTS - COLD TEST STREAM (ANALYTICAL S3 TEST FLOW).

	Annex/App/Para	Munition number																									
Test Asset Configuration		27	28	~~29~~	~~30~~	31	32	33	34	~~35~~	36	~~37~~	38	~~39~~	40	41	~~42~~	~~43~~	~~44~~	45	~~46~~	~~47~~	~~48~~	~~49~~	~~50~~	~~51~~	~~52~~
Tactical Seeker											x			~~x~~						x							
~~Tactical Warhead~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~
Tactical Propulsion Unit		x	x	~~x~~	~~x~~	x	x	x	x	~~x~~	x	~~x~~	x	~~x~~	x	x	~~x~~	~~x~~	~~x~~	x	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~
Tactical Guidance and Control System											x			~~x~~						x							
Initial Baseline Inspection	7.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Common carrier vibration (packaged)	C/2/1.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~													
Level II inspection	7.3	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Humid heat (10 cycles)	C/1/1.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level I inspection	7.2	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	~~h~~	~~h~~	h	h	h	h	~~h~~	h	~~h~~	h	~~h~~	h	h	~~h~~	~~h~~	~~h~~	h	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~	~~h~~
Level II inspection	7.3	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Parachute drop shock - low velocity (packaged)	C/2/5.3		c		~~c~~		c		c		c		c		c		~~c~~		~~c~~		~~c~~		~~c~~		~~c~~		~~c~~
Level II inspection	7.3	a	a	~~a~~	~~a~~	a	a	a	a	~~a~~	a	~~a~~	a	~~a~~	a	a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Restrained cargo shock (unpackaged)	C/2/2.3	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
Loose cargo (packaged)	C/2/2.1.2	c	c			c	c			~~c~~	c			~~c~~	c			~~c~~	~~c~~			~~c~~	~~c~~			~~c~~	~~c~~
Loose cargo (unpackaged)	C/2/2.1.2			~~c~~	~~c~~			c	c			~~c~~	c			c	~~c~~			c	~~c~~			~~c~~	~~c~~		
Level II inspection	7.3	a		~~a~~	~~a~~	a		a								a	~~a~~	~~a~~	~~a~~	a	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~	~~a~~
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	c		~~c~~		c		c		~~c~~		~~c~~		~~c~~		c		~~c~~		c		~~c~~		~~c~~		~~c~~	
Level II inspection	7.3	c	c	~~c~~	~~c~~	c	c	c	c	~~c~~	c	~~c~~	c	~~c~~	c	c	~~c~~	~~c~~	~~c~~	c	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~	~~c~~
~~Immersion~~	C/1/7.0	~~x~~																									
~~Salt fog~~	C/1/8.0		~~x~~																								
~~Sand & dust~~	C/1/9.0																										
~~Rain/Watertightness~~	C/1/10.0																										
~~Icing~~	C/1/11.0			~~x~~																							
~~Altitude~~	C/1/12.0				~~x~~																						
Level III Inspection (BTCA)	7.4	a	a	~~a~~	~~a~~																						
Free Flight Firing	D/1/1										c			~~c~~						c							
~~Fuze Arming~~	D/1/2											~~c~~									~~c~~	~~c~~	~~c~~	~~c~~			
Fire From Enclosure	D/1/3												c												~~c~~		
Static RM firing (UFT & LFT)	D/2/1					h	c	c	h						h	h											
Other energetic static fire	D/2/4					a	a	a							a	a											
~~RM burst integrity (hydraulic)~~	D/2/2									~~a~~							~~a~~	~~a~~	~~a~~							~~a~~	~~a~~
~~Other Pressure Vessel burst integrity~~	D/2/3									~~a~~							~~a~~	~~a~~	~~a~~							~~a~~	~~a~~

key:	
a	ambient
h	hot
c	cold
x	required

ANNEX B. S3 TEST PROGRAM.

APPENDIX 3. WORKED EXAMPLE OF TEST TAILORING FOR A SHOULDER LAUNCHED MISSILE SYSTEM.

TABLE B3-3. TAILORED SEQUENTIAL TESTS (REDUCED ANALYTICAL S3 TEST FLOW).

	Annex/App/Para	Munition number											Munition number										
Test Asset Configuration		1	2	5	6	7	8	10	12	14	15	19	27	28	31	32	33	34	36	38	40	41	45
Tactical Seeker								x				x							x				x
Tactical Propulsion Unit		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tactical Guidance and Control System								x				x							x				x
Initial Baseline Inspection	7.1	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Common carrier vibration (packaged)	C/2/1.1	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Packaged transit drop (2.1m multiple orientations)	C/2/1.2	h	h	h	h	h	h	h	h				c	c	c	c	c	c	c	c			
Level II inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Humid heat (10 cycles)	C/1/1.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Low temperature storage (3days @ -51°C)	C/1/2.0	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature storage (9days @ +71°C)	C/1/3.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
High temperature cycling (28 A1 induced temperature cycles)	C/1/4.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Solar radiation (7 A1 cycles)	C/1/5.0	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level I inspection	7.2	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Thermal Shock - Low temperature phase (5 cycles)	C/1/6.0a	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Thermal Shock - High temperature phase (5 cycles)	C/1/6.0b	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h
Level II inspection	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - turboprop (packaged)	C/2/5.1.1	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Fixed wing air cargo vibration - jet (packaged)	C/2/5.1.2	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Helicopter cargo vibration (packaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Helicopter cargo vibration (unpackaged 50% duration)	C/2/5.2	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Parachute drop shock - low velocity (packaged)	C/2/5.3		h		h		h	h	h	h				c		c		c	c	c	c		
Level II inspection	7.3	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Wheeled vehicle transport vibration (packaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Wheeled vehicle transport vibration (unpackaged 50% duration)	C/2/2.1.1	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Tracked vehicle transport vibration (unpackaged)	C/2/2.2	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Restrained cargo shock (unpackaged)	C/2/2.3	h	h	h	h	h	h	h	h	h	h	h	c	c	c	c	c	c	c	c	c	c	c
Loose cargo (packaged)	C/2/2.1.2	h	h	h	h			h		h			c	c	c	c			c		c		
Loose cargo (unpackaged)	C/2/2.1.2					h	h		h		h	h					c	c		c		c	c
Level II inspection	7.3	a		a		a					a	a	a		a		a					a	a
Unpackaged transit drop (1.5m multiple orientations)	C/2/3.0	h		h		h					h	h	c		c		c					c	c
Level II inspection	7.3	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
Level III Inspection (BTCA)	7.4	a	a										a	a									
Free Flight Firing	D/1/1							h				h							c				c
Fire From Enclosure	D/1/3								h											c			
Static RM firing (UFT & LFT)	D/2/1			h	c	c	h			h	h				h	c	c	h			h	h	
Other energetic static fire	D/2/4			a	a	a				a	a				a	a	a				a	a	

key:	
a	ambient
h	hot
c	cold
x	required

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

This annex provides descriptions of all of the environmental (climatic and dynamic) tests required in the S3 Test Programs included in Annex B. Rationale for these tests is provided in Annex A.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 1. CLIMATIC TEST DESCRIPTIONS.

1. HUMID HEAT.

a. Munition Configuration.

This test should be conducted with the munitions in the unpackaged configuration.

b. Test Levels.

Conduct an aggravated humidity test on all munitions using guidance in accordance with AECTP 300, Method 306, Procedure 1, Cycle 3.

c. Test Duration.

The humidity test should be conducted for 10 days.

2. LOW TEMPERATURE STORAGE.

a. Munition Configuration.

This test should be conducted with the munitions in the unpackaged configuration.

b. Test Levels.

Conduct the low-temperature test in accordance with AECTP 300, Method 303, Procedure 1, at the constant temperature of -51 ºC.

c. Test Duration.

The low temperature test should be conducted for 3 days.

3. HIGH TEMPERATURE STORAGE.

a. Munition Configuration.

This test should be conducted with the munitions in the unpackaged configuration.

b. Test Levels.

Conduct the high-temperature test in accordance with AECTP 300, Method 302, Procedure 1, at the constant 71 ºC.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 1. CLIMATIC TEST DESCRIPTIONS.

c. Test Duration.

The high temperature test should be conducted for 9 days.

4. HIGH TEMPERATURE CYCLE.

a. Munition Configuration.

This test should be conducted with the munitions in the unpackaged configuration.

b. Test Levels.

Conduct the high-temperature cycle in accordance with AECTP 300, Method 302, Procedure 1, Category A1 (induced conditions).

c. Test Duration.

The high temperature cycle test should be conducted for 28 diurnal cycles.

5. SOLAR RADIATION.

a. Munition Configuration.

This test should be conducted with the munitions in the unpackaged configuration.

b. Test Levels.

Conduct solar test in accordance with AECTP 300, Method 305, Procedure 1, Category A1.

c. Test Duration.

Conduct 7 solar test cycles.

6. THERMAL SHOCK.

Expose all munitions to the high- and low-temperature phases of the temperature shock tests in accordance with AECTP 300, Method 304, Procedure 1 and as described below. Munitions are tested in their unpackaged configuration.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 1. CLIMATIC TEST DESCRIPTIONS.

a. Low Temperature Phase.

Conduct five cycles of the low temperature phase temperature shock test in accordance with AECTP 300, Method 304, Procedure 1 and the following test parameters:

(1) The high temperature shall be 21 ºC and the low temperature chamber shall be -46 ºC.

(2) Munitions are to remain in each chamber until temperature stabilization is achieved (24 hours maximum).

b. High Temperature Phase.

Conduct five cycles of the high temperature phase temperature shock test in accordance with AECTP 300, Method 304, Procedure 1 and the following test parameters:

(1) The high-temperature shall be the unpackaged SRE temperature and the low-temperature chamber shall be -5 ºC.

(2) Munitions are to remain in each chamber until temperature stabilization is achieved (24 hours maximum).

7. SUPPLEMENTAL CLIMATIC TESTS.

7.1 Immersion.

Perform per AECTP 300, Method 307 on the munitions in the unpackaged configuration with the following test parameters:

a. Conditioning Temperature.

Munitions are to be preconditioned to a temperature of 27 ºC above the water temperature to represent exposure to solar heating immediately prior to immersion.

b. Depth of Immersion.

Apply an immersion depth of 1 meter, or equivalent pressure, to represent complete immersion.

c. Duration of Immersion.

Munitions are to remain immersed for a period of 30-minutes.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 1. CLIMATIC TEST DESCRIPTIONS.

8. SALT FOG.

Perform per AECTP 300, Method 309 on the munitions in the unpackaged configuration for two cycles alternating wet-dry-wet-dry (24 hrs each).

9. SAND AND DUST.

Perform per AECTP 300, Method 313, Procedures I and II, on the munition in the unpackaged configuration. These tests should be conducted at the 49 ºC temperature. Apply default blowing dust test parameters as specified in Method 313, Procedure I. Apply blowing sand test parameters consistent with Method 313, Procedure II for material that may be used near operating surface vehicles. It is acceptable to conduct the sand and dust tests individually.

10. RAIN/WATERTIGHTNESS.

Perform per AECTP 300, Method 310, Procedure 1 on the munition in the unpackaged configuration. Expose the munition to the steady state rainfall rate of 100 mm/hr and duration of 2 hrs. Temperature precondition the munitions approximately 10 ºC above the rain water temperature prior to each exposure period. Wind velocity of 18 m/s should be applied during the steady state test.

11. ICING.

Perform per AECTP 300, Method 311 on the munitions in the unpackaged configuration with medium loading ice thickness representing general conditions.

12. LOW PRESSURE (ALTITUDE).

Conduct Rapid Decompression on a packaged munition per AECTP 300, Method 312, Procedure III with a cargo pressure equivalent to the highest value specified in Table 1 of AECTP 300, Method 312.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

1. LAND TRANSPORTATION DYNAMICS – LOGISTIC.

1.1 Common Carrier Vibration.

Although the common carrier vibration environment is relatively benign compared to other wheeled vehicle vibration environments, the test should not be tailored out due to the intent of loosening up the test article and packaging prior to conduct of temperature and humidity tests.

a. Test Temperature.

Temperature condition the items prior to, and during vibration testing. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged SRE.

b. Munition Configuration.

This test may be conducted on individual packaged munitions or with a palletized set of munitions.

c. Test Procedure.

Vibrate each munition in accordance with the ‘Ground Wheeled Common Carrier’ vibration schedules of AECTP 400, Method 401.

d. Test Duration.

The test should be conducted for a test duration equivalent to the distance specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missiles on Commercial and Military Land Vehicles combined.

1.2 Packaged Transit Drop.

Due to the severity of this test, only half of the logistic land transportation dynamics test quantity should be subjected to the packaged transit drop.

a. Test Temperature.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

Temperature condition the items prior to conducting the packaged handling drop tests. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged SRE temperature. Drop tests should be conducted within the shortest duration possible upon removal from the conditioned environment. The maximum duration should be no longer than 30 minutes. During transport from the conditioned environment to the test site, it is good practice to minimize heat transfer effects through the use of thermal mitigation measures (i.e. insulated transport box or insulating blanket).

b. Munition Configuration.

This test is conducted with the munitions packaged in their logistic container.

c. Test Procedure.

Conduct two handling drop test on each drop test munition from height of 2.1 meters onto a concrete supported steel surface. The drop test should be conducted in accordance with AECTP 400, Method 414, Procedure 1.

d. Drop Orientation.

(1)The test item is to be released such that it will approximate an initial impact in two of the following orientations:

(a) Major axis vertical, nose up.

(b) Major axis vertical, nose down.

(c) Major axis horizontal.

(d) 45 ° major axis nose down.

(e) 45 ° major axis base down.

(2) The sample size shall be subdivided to ensure at least one impact occurs in each of the orientations.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

2. LAND TRANSPORTATION DYNAMICS - TACTICAL.

Tactical Land Transportation Dynamics includes Wheeled Vehicle Transportation Dynamics, Tracked Vehicle Transportation Dynamics, Restrained Cargo Shocks, and Unpackaged Handling Drop Shocks as described below. All tests under these sections must be completed in order to satisfy the S3 objectives for Tactical Land Transportation Dynamics.

2.1 Wheeled Vehicle Transportation Dynamics.

Wheeled Vehicle Transportation Dynamics includes both Secured and Unsecured (Loose) Cargo tests as described below. All tests under these sections must be completed.

2.1.1 Wheeled Vehicle Transportation Vibration - Secured Cargo.

a. Test Temperature.

Stabilize all cold munitions to -46 ºC and all hot munitions to the packaged or unpackaged SRE temperature prior to vibration testing. Test temperature is to be maintained throughout vibration testing.

b. Munition Configuration.

This test should be conducted on individual munitions in combat transport and tie-down configuration. For systems that may be transported in or out of the transport container, the test duration should be split with half of the test duration packaged in the transport container and half of the test duration unpackaged.

c. Test Procedure.

Test each munition in accordance with AECTP 400, Method 401, Annex A, using the ‘Tactical Wheeled Vehicle’ and ‘Two Wheeled Trailer’ vibration test schedules.

d. Test Duration.

The Tactical Wheeled Vehicle vibration should be conducted for a test duration equivalent to the minimum of 4000 km or 70% of the distance specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missile on Combat Platform. The Two-Wheeled Trailer vibration should also be conducted for a test duration equivalent to the minimum of 250 km or 5% of the distance specified in AECTP 100, Annex E, Appendix 1, for a Man Portable Missile on Combat Platform.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

2.1.2 Loose Cargo.

a. Test Temperature.

Stabilize all cold munitions to -46 ºC and all hot munitions to the appropriate packaged or unpackaged SRE temperature prior to testing. Test temperature is to be maintained throughout testing.

b. Munition Configuration.

This test should be conducted with half of the munitions in the unpackaged configuration at the unpackaged SRE temperature, and the half of the munitions packaged at the packaged SRE temperature.

c. Test Procedure.

Conduct the loose cargo test in accordance with AECTP 400, Method 406, Annex A, Procedure I or II, depending on configuration.

d. Test Duration.

The loose cargo test should be conducted for a minimum of 20 minutes or a total test duration equivalent to 5% of the distance specified in AECTP 100, Annex E, Appendix 1, for a Man Portable Missile on Combat Platform. Half of the test duration should be with the munition in the horizontal orientation and the other half with the munition in the vertical orientation. Furthermore, half of the vertical duration should be forward end up and the other half with the forward end down.

2.2 Tracked Vehicle Transportation Vibration.

a. Test Temperature.

Stabilize all cold munitions to -46 ºC, and all hot munitions to the unpackaged SRE temperature prior to vibration testing. Test temperature is to be maintained throughout vibration testing.

b. Munition Configuration.

This test should be conducted with the munitions in the unpackaged combat transport and tie-down configuration.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

c. Test Level.

Vibration test each item in accordance with AECTP 400, Method 401, Annex B, using the 'Light Vehicle - Material on Sponson or Installed in Hull' vibration test schedules.

d. Test Duration.

The 'Light Vehicle - Material on Sponson or Installed in Hull' vibration should be conducted for a test duration equivalent to the minimum of 1000 km or 20% of the distance specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missile on Combat Platform.

2.3 Restrained Cargo Transport Shock.

a. Test Temperature.

Stabilize all cold munitions to -46 ºC, and all hot munitions to the unpackaged SRE temperature prior to shock testing. Test temperature is to be maintained throughout shock testing.

b. Munition Configuration.

This test should be conducted on individual unpackaged munitions.

c. Test Level and Configuration.

Conduct transport shock in accordance with Table C2-1. The shock test schedule shown in Table C2-1 can be undertaken using either half sine pulses applied in each sense of each orthogonal axis or a single decaying sinusoidal pulse encompassing both senses in each axis. Terminal peak sawtooth pulses or Shock Response Spectrum (SRS) methods may be substituted for the levels specified in Table C2-1 if it can be shown to produce equivalent velocities. AECTP 400, Method 417, provides guidance for SRS methods.

d. Test Duration.

The set of shocks specified in Table C2-1 is equivalent to the 1000 km in off-road ground vehicle (wheeled and tracked) transportation. The number of shocks to be conducted should be equivalent to 20% of the distance specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missile on Combat Platform.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

TABLE C2-1. RESTRAINED CARGO TRANSPORT SHOCK LEVELS

HALF SINE PULSE	OR	DECAYING SINUSOID	
Duration 5 ms		Frequency (F): 100 Hz Duration (T): 0.37 s (No. of Complete Cycles (N): 37) Damping Factor: 3% of critical	
Amplitude, (g pk)	Number of Shocks	Amplitude of First Peak,(g pk)	Number of Repetitions
8.0	42	8.0	42
10.0	21	10.0	21
12.0	3	12.0	3

3. UNPACKAGED TRANSIT DROP.

Due to the severity of this test, not all of the tactical land transportation dynamics test quantity should be subjected to the packaged transit drop. See Annex B for test quantities.

a. Test Temperature.

Temperature condition the items prior to conducting the handling drop tests. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the unpackaged SRE temperature. Drop tests should be conducted within the shortest duration possible upon removal from the conditioned environment. The maximum duration should be 15 minutes. During transport from the conditioned environment to the test site, it is good practice to minimize heat transfer effects through the use of thermal mitigation measures (i.e. insulated transport box or insulating blanket).

b. Munition Configuration.

Drop tests are to be conducted with the item(s) in the unpackaged or ready-to-fire configuration.

c. Test Procedure.

Conduct unpackaged handling drop in accordance with AECTP 400, Method 414, Procedure 1 (Transit Drop). Conduct one handling drop test on each drop test munition from height of 1.5 meters onto a concrete supported steel surface.

d. Drop Height and Orientation.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

(1) Drop each item two times from height of 1.5 meters onto a concrete-supported steel surface. The test item is to be released such that it will approximate an initial impact in two of the following orientations:

(a) Major axis vertical, nose up.

(b) Major axis vertical, nose down.

(c) Major axis horizontal.

(d) 45 ºmajor axis nose up.

(e)- 45 ºmajor axis nose down.

(2) The sample size shall be subdivided to ensure at least one impact occurs in each of the orientations. Furthermore, the sample should be further subdivided such that half the items are dropped in the unpackaged configuration and half the items are dropped in the ready-to-fire configuration. Drop tests in the ready-to-fire configuration may not be required if a known failure mode will occur that would obviously render the munition inoperable (e.g. shattered seeker). In this case, all drops would be in the unpackaged configuration.

4. <u>SHIPBOARD SHOCK (UNDEX)</u>.

This test may be conducted as a non-sequential test on one munition if the criteria is ‘safe of disposal’ or on all munitions as a sequential test if the test criteria is ‘safe for use’.

a. Test Temperature.

Conduct UNDEX Shock at ambient temperature.

b. Munition Configuration.

Conduct UNDEX Shock on individual packaged munition(s) or with a palletized set of munitions.

c. Test Procedure.

Test in accordance with procedures specified in AECTP 400, Method 419.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

d. Test Severity.

Test severity to be determined by National Authority to ensure Safe for Disposal requirements are met.

5. AIR TRANSPORTATION DYNAMICS.

Air Transportation Dynamics includes Fixed and Rotary Wing Air Cargo Vibration and Parachute Drop Shock as described in the following sections. All tests under these sections must be completed in order to satisfy the S3 objectives for the Air Transportation Dynamics.

5.1 Fixed Wing Air Cargo Vibration.

Fixed Wing Air Cargo Vibration includes both Turboprop and Jet Aircraft Vibration as described in the following sections.

5.1.1 Turboprop Aircraft.

a. Test Temperature.

Temperature condition the items prior to, and during the vibration test. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged SRE temperature.

b. Munition Configuration.

This test may be conducted on individual packaged munitions or with a palletized set of munitions.

c. Test Level.

Test each munition in accordance with levels specified in AECTP 400, Method 401, Annex C, for ‘Propeller Aircraft’ for the C130K (4-blade, f0=68 Hz) and the C130J (6 blade, f0=102 Hz).

d. Test Duration.

The test should be conducted for a total test duration equivalent to the flight duration specified in AECTP 100, Annex E, Appendix 1, for Man Portable Missiles on Turboprop Aircraft. The total test duration should be split such that half of the duration is conducted with the C130J test requirement, and half the duration is conducted with the C130K test requirement.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

5.1.2 Jet Aircraft.

a. Test Temperature.

Temperature condition the items prior to, and during the vibration test. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged SRE temperature.

b. Munition Configuration.

This test may be conducted on individual packaged munitions or with a palletized set of munitions.

c. Test Procedure.

Vibration test each item in its logistic packaging and tie-down configuration in accordance with levels specified in AECTP 400, Method 401, Annex C, ‘Jet Aircraft Cargo - Takeoff’ vibration. ‘Jet Aircraft Cargo - Cruise’ vibration was eliminated based on an assessment that this environment is benign compared to other S3 test environments.

d. Test Duration.

The test should be conducted for a test duration equivalent to flight duration specified in AECTP 100, Annex E, Appendix 1, for Man Portable Munition on Jet Aircraft. Since the test procedure is based on the takeoff environment only, the test duration is based on the number of flights. Apply an average flight time of 10 hrs per transport to determine the appropriate number of takeoff events.

5.2 Helicopter Cargo Vibration.

a. Test Temperature.

Temperature condition the items prior to, and during the vibration test. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged or unpackaged SRE temperature, depending on munition configuration to be tested.

b. Munition Configuration.

This test shall be conducted on each munition in both the individual packaged and unpackaged configurations. The test duration should be split with half of the test duration packaged in the transport container, and half of the test duration unpackaged.

ANNEX C. ENVIRONMENTAL TEST DESCRIPTIONS.

APPENDIX 2. DYNAMIC TEST DESCRIPTIONS.

c. Test Procedures.

Vibration test each munition in accordance with AECTP 400, Method 401, Annex D, 'Helicopter Cargo' vibration test schedule using the fundamental blade rates (f_1 component) of 11, 17, 22, and 26 Hz.

d. Test Duration.

The test should be conducted for a total test duration equivalent to the flight hours specified in AECTP 100, Annex E, Appendix 1, for Man Portable Munition in Helicopter Air Transportation. This duration is to be divided equally between the sets of blade rates specified in Paragraph 5.2.c. Furthermore, half of the test duration is to be conducted with the munitions packaged configuration, and half of the duration is to be conducted with the munitions in the unpackaged configuration.

5.3 Parachute Drop Shock - Low Velocity.

Due to the severity of this test, only half of the aircraft dynamics test quantity should be subjected to the low velocity parachute drop shock.

a. Test Temperature.

Temperature condition the items prior to, and during the vibration test. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot items to the packaged SRE temperature.

b. Munition Configuration.

Conduct this test on individual packaged or palletized munitions with appropriate parachute drop specific padding/crushable material.

c. Test Procedure.

Conduct one drop in accordance with AECTP 400, Method 414, from a height of 8 m onto concrete to simulate a Low Velocity Air Drop. The test item is to be released such that it will approximate an initial impact drop orientation of base down. A laboratory shock test may be applied if it can be demonstrated to produce an equivalent velocity and loading on the munition.

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ANNEX D. OPERATING TEST DESCRIPTIONS.

This annex provides descriptions of all of the firing and operating tests required in the S3 Test Programs included in Annex B. Rationales for these tests are provided in Annex A.

ANNEX D. OPERATING TEST DESCRIPTIONS.

APPENDIX 1. ALL-UP-ROUND (AUR) FIRING TEST DESCRIPTIONS.

The AUR firing tests are performed upon completion of the sequential environmental tests. The AUR firing tests are described below and consist of free flight, fuze arming, and fire from enclosure testing. All of these tests are conducted remotely with the munition temperature conditioned to the appropriate temperature. The low-temperature test items are to be temperature stabilized to -46 ºC prior to performing the firing tests. The high-temperature test items are to be temperature stabilized to 63 ºC or the unpackaged SRE temperature, whichever is higher, prior to performing the firing tests. Firing tests should be conducted within the shortest duration possible upon removal from the conditioned environment. The maximum duration should be 15 minutes.

1. FREE FLIGHT FIRING.

The free flight firing tests are conducted on an instrumented firing range to demonstrate that the munition: is safe to launch (does not eject hazardous debris or detonate upon ignition), safely separates from the launch point/tube, and travels and explosively functions at trajectories which cause no additional hazards to the firing crew. Performance data shall be recorded but not used as acceptance criteria except as related to safety. Additional data is collected to support the Weapon Danger Area and Health Hazard Analyses.

a. Record launch, early flight, and air burst or target impact portions of the flight with high-speed cameras, radars, or infrared sensors. Record fire control and ground signals. Obtain air burst data, munition position and velocity data, and as applicable, miss distance data for these firings.

b. Health and Safety Hazard Analysis.

Collect noise, blast overpressure, launch blast debris, toxic gases, thermal effects, radiance, and launch shock (recoil) data in accordance with Annex H, Appendix 2. These data are collected at positions to be occupied by the launch crew. Also collect these data outside of the firing position to define the launch space that is unsafe for occupancy during firings.

c. Weapon Danger Area Analysis.

Plot all munition impact coordinates (measured during successful and unsuccessful dynamic firings) on weapon danger area profiles. Develop statistical density distributions of the impacts for assessment of the specified weapon danger area profiles, and the firing range safety profiles. Use warhead arming and functioning data from the unmanned firings and the warhead arena trials (Annex D, Appendix 2, paragraph 1.4), combined with munition impact data and weapon danger area profiles, to assess launch area safety and downrange safety, including friendly Soldier over flight safety, as applicable. Further guidance may be found in STANAG 2240, Allied Range Safety Publication 1 (ARSP-1 VOL II) Weapon Danger Areas, Zones for Unguided Weapons For Use by NATO Forces in a Ground Role.

ANNEX D. OPERATING TEST DESCRIPTIONS.

APPENDIX 1. ALL-UP-ROUND (AUR) FIRING TEST DESCRIPTIONS.

2. FUZE ARMING DISTANCE FIRING.

These tests are used in combination with warhead arena trials to determine whether the no-arm or "minimum arm distance" exceeds the safe separation distance for the item. Detailed guidance may be found in the AOP-20, Manual of Tests for the Safety Qualification of Fuzing Systems.

a. Fuzes function in two primary modes: point detonating and air burst (others may include a delay feature). The Projectile Fuze Arming Distance procedure(s) of AOP-20 are used to determine the operator safety for point detonating and delay type fuzing systems. For an air burst type fuzing system, the minimum arm distance is determined using the Time to Air Burst test approach in AOP-20 Test D3.

b. Fire items at an instrumented range and record launch, early flight, and air burst or target impact portions of the flight with high-speed cameras, radars, or infrared sensors. Record fire control and ground signals, as well as target configuration and distance from launch point. Obtain time to burst data, munition position and velocity data, and as applicable, miss distance data for these firings.

c. Health Hazard Analysis.

Collect noise, blast overpressure, launch blast debris, toxic gases, thermal effects, radiance, and launcher reaction data in accordance with Annex H, Appendix 2. These data are collected at positions to be occupied by the launch crew. Also collect these data outside of the firing position to define the launch space that is unsafe for occupancy during firings.

d. In the event that the minimum arming distance is less than the safe separation distance, a fuze sensitivity test is required to assess potential hazards associated with hitting light obstructions (e.g. brush, vegetation).

3. FIRE FROM ENCLOSURE.

This is a special case of the free flight firing test in which munitions are fired out of specially designed rooms or enclosures. The test provides data to allow the subsequent assessment of the minimum size room from which a weapon may be fired without harming the occupants of the room. Most shoulder launched munitions will require this test. Review weapon operational scenarios to determine its applicability. For further guidance, refer to ITOPs 05-2-517 and 05-2-502.

ANNEX D. OPERATING TEST DESCRIPTIONS.

APPENDIX 1. ALL-UP-ROUND (AUR) FIRING TEST DESCRIPTIONS.

a. Health and Safety Hazard Analysis.

Acoustic noise, blast overpressure, toxic gasses, oxygen starvation, and launch debris are the primary data obtained from the test. The configuration of the 'Fire from Enclosure' room should be well documented to ensure the data are reduced properly. The following information with respect to the room should be recorded:

(1) Total room volume (length, width, and height). Objects of significant volume such as weapon launch fixture base, anthropomorphic dummies, large cameras, etc., would be subtracted from room volume.

(2) Total vented area (firing window, doors, and other windows).

(3) Window/door positions measured with respect to rear of launch tube and with respect to projectile tube exit location.

(4) Secondary room volume (if applicable) and its position with respect to primary room. Also determine the vented area connecting to primary room.

(5) Transducer locations relative to walls, weapon, ceiling, floor, and the type of mounting (tripod / anthropomorphic).

(6) Toxic gas collector locations relative to walls, weapon, ceiling, floor, and the type of mounting (tripod / anthropomorphic).

b. Install all transducers and collectors in the 'Fire from Enclosure' room. Position the weapon in the remote firing stand. Fire the weapon remotely. Record and analyze the data to determine hazards to the operator. Attention should also be paid to rearwards effects such as efflux and projected debris from propulsion systems.

ANNEX D. OPERATING TEST DESCRIPTIONS.

APPENDIX 2. COMPONENT LEVEL OPERATING TEST DESCRIPTIONS.

Munitions that have undergone sequential environmental testing require component level assessment of energetic and pressure vessel components in order to estimate the probability and effect of catastrophic failure during operational use. In addition to warheads and rocket motors, other items may require these tests. Examples are gas generators, pressure vessels, or thermal beacons which could burst during operation and present a hazard to personnel. See Annex A, Appendix 2 for additional background and rationale.

1. ROCKET MOTOR STATIC FIRING.

Static firings are conducted to measure the internal operating pressure of rocket motors during operational use. Guidance for this test may be found in ITOP 05-2-500.

a. The items should be temperature conditioned to -46 ºC and 63 ºC, or the unpackaged SRE.

b. Mount the item in an appropriate static firing stand.

c. Instrument item with pressure, force, strain, temperature, and vibration transducers as required.

d. Static fire item and record internal operating pressure, thrust, strain, temperature, and acceleration parameters as required.

e. Perform a post test inspection of the motor to check for 'burn-through' of rocket motor case, heat damage to nozzle/venture, and damage to thermal barrier (if present).

f. The probability of motor case rupture is estimated using the static firing and burst test pressure data in the statistical method presented in Annex G.

2. ROCKET MOTOR BURST TESTS.

Burst tests are conducted to measure the pressure required to burst the rocket motor case under conditions similar to actual firing. These tests are conducted at ambient temperature. Two test methods are described below. Position the item in an appropriate restraining fixture and instrument with pressure transducers to record the internal operating pressure. The probability of motor case rupture is estimated using the static firing and burst test pressure data in the statistical method presented in Annex G. Further guidance on bursts test methods may be found in ITOP 05-2-621.

ANNEX D. OPERATING TEST DESCRIPTIONS.

APPENDIX 2. COMPONENT LEVEL OPERATING TEST DESCRIPTIONS.

a. Hydrostatic Burst Test Method.

Conduct the hydrostatic burst test with or without propellant in the motor case. Note, however, that it is recommended to conduct this test with propellant in the motor case since test results could be affected if the case is damaged during the propellant removal process. Fill the rocket motor completely with an inert test fluid such as water. Using a high-pressure pump or a bursting diaphragm arrangement, rapidly pressurize the vessel until it bursts. Note that the fluid line should have provisions for an additional volume of test fluid to be pumped into the vessel to account for motor case expansion. The rate of pressurization shall approximate the pressurization rate of a normally fired motor.

b. Dynamic Burst Test Method.

The rocket motor will have a modified, choked, or plugged nozzle. The nozzle restriction shall be designed to allow the pressure to increase rapidly and repeatedly. The modification should not change the vessel's structural integrity. Upon motor initiation, the rate of pressurization should approximate the rate of a normally fired motor.

3. OTHER PRESSURE VESSELS.

Other types of pressure vessels (gas generators, high pressure pneumatic vessels, etc.) in the munition are hydrostatically burst tested to assess personnel hazards and determine safety design margins. Compare burst pressures to determine the safety margin and the likelihood of burst. Determine the fragment size, the velocity, and the fragment distribution to assess the hazard in the event of burst during service use of the vessel.

4. OTHER ENERGETICS.

Other types of energetic materials in the munition (e.g. thermal batteries, safe and arm devices, squibs) are static fired to assess functionality with respect to safe operation.

ANNEX E. BREAKDOWN TEST AND CRITICAL ANALYSIS (BTCA).

1 GENERAL INSPECTION.

1.1 All trial munitions shall be subjected to visual inspection and cold radiography (using the lowest storage temperature from the LCEP) upon their receipt at the trial establishment.

1.2 Visual inspection shall be carried out between each test within the sequential environmental trial. Additional radiography (ambient or cold depending on the assessed likely failure modes) may be required at key points during the sequential environmental trial where it is suspected there may be an increased likelihood of damage from individual environmental tests. Final inspection at the end of the sequential environmental trial shall consist of visual inspection and cold radiography.

1.3 Non-functioning tests should be carried out as part of routine examination prior to and during the sequential environmental trial. Techniques may include using electronic test sets, arming then disarming the munition (only if it is safe to do so) and igniter resistance checks on rocket motors. These tests can give important information regarding the continued safety and safe functioning of the munition.

1.4 The condition of any packaging materials and desiccants should also be noted along with the condition of the munition.

2. BREAKDOWN AND ANALYSIS REQUIREMENTS.

2.1 The following tests are broadly applicable to warheads (main charge and firing train), rocket motors (main charge, igniter, intermediaries) and pyrotechnic devices (actuators, tracers, etc).

2.2 The exact requirements for BTCA need to be determined on a case-by-case basis taking into consideration the degree of novelty and/or complexity of the munition. They will be determined by known failure modes and life limiting factors for comparable munitions.

2.3 Prior to commencement of all trials, at least one munition from the same batch/lot as those undergoing the sequential environmental trial should be disassembled and analysed to identify potential failure modes that may occur. This sets the baseline for comparison against the environmentally stressed munitions. There should also be baseline munitions for the functioning (dynamic and static firing) tests. It may also be possible to use the results from material qualification tests (STANAG 4170) for baseline purposes, or data from material manufacturers batch/lot acceptance tests provided these give data equivalent to that from the qualification tests. Furthermore, firing data from development trials may be used for baseline purposes provided the munition is of the same build standard as the test munitions and provides the required data. However, it should be noted that none of these latter options will permit comparison against the physical condition of the all-up-rounds following the sequential environmental trial.

ANNEX E. BREAKDOWN TEST AND CRITICAL ANALYSIS (BTCA).

2.4 It is essential to ensure that the same test procedures used to determine the baseline properties of materials are used during BTCA.

2.5 During disassembly and material extraction, care must be taken to ensure that the extracted samples do not become contaminated (by structural materials or other matter) and/or physically damaged/changed (e.g. compressed, cracked, abraded, etc.).

2.6 Small items such as igniters, initiators, squibs, etc., pose particular difficulties during disassembly, and it may not be possible to extract sufficient material without damaging the material contained within. In such cases it is acceptable to perform just visual and radiographic examination followed by functioning tests (at extremes of service temperature). In some cases it may be possible to extract sufficient material to perform small scale tests such as volatile content determination or Differential Scanning Calorimetry (DSC).

2.7 The aspects below are provided as an indication of the types of testing required.

2.7.1 <u>Inspection Prior to Disassembly</u>.

2.7.1.1 Physical integrity and dimensional checks of the munition, sub-systems, energetic materials, and structural materials. This can be achieved through visual examination (including photography as required), radiography, computed tomography (CT) scan, dye penetrant, borescope (for rocket motor conduits), ultrasonic inspection, and/or fluoroscopy both prior to, and following disassembly. Some techniques may be more applicable to structural materials which must also be assessed. Dimensional checks should assess physical dimensions and mass of the all-up-munition, sub-systems, and energetic materials to demonstrate compliance with specifications/drawings.

2.7.2.2 During disassembly, pay particular attention to signs of cracking, surface crystallisation/dusting (e.g. ammonium perchlorate in rocket motors and nitramines in warheads), debonding/delamination (e.g. thermal liners and inhibitors for rocket motors), exudation (e.g. energetic and inert plasticisers in rocket motors), corrosion, discolouration, wear, missing components, and other damage.

2.7.1.3 Plastics, rubbers, foams, seals, etc., should be examined for signs of degradation or uptake of plasticiser. Examine ‘O-rings’ for compression set and that they still meet their specification requirements.

2.7.1.4 Finally, activate safe/arm and any other mode selectors arm, then disarm the munition (only if it is safe to do so). Record all variables and observations.

2.7.2 <u>Chemical Tests</u>.

a. Chemical composition, including total volatile matter and moisture content, must be assessed to demonstrate compliance with specifications/drawings.

ANNEX E. BREAKDOWN TEST AND CRITICAL ANALYSIS (BTCA).

b. Chemical stability must be assessed for all energetic materials, although the tests used will be material dependant. The vacuum stability test is particularly applicable for main charge explosives. Chemical stabilizer depletion testing (AOP-48) is applicable for nitrate-ester propellants, with a preference for multi-temperature aging since this gives both stabilizer content and chemical kinetics.

2.7.3 Compatibility Tests.

a. Chemical/explosive compatibility (per STANAG 4147) between all components of construction with the explosives they will be in contact with (both in physical contact and by gas/vapor path) should have been assessed during material qualification and/or design of the munition. This compatibility data shall be presented as a matrix that lists the materials, and for each explosive, declares whether there is contact or not with evidence to support the claim of compatibility where contact is expected.

b. During BTCA, any material incompatibilities and/or migration of explosive species are likely to become evident during the Level 1 visual inspection. Any such anomalies observed shall be noted and assessed further to address whether the munition remains safe as defined AAS3P-1. An example is the migration of energetic plasticisers into thermal liners in rocket motors, which may render the thermal liner incapable of fulfilling its intended design role and give rise to an unsafe situation.

2.7.4 Physical Properties - Explosive Materials.

a. Assessment of flow properties and particle size distribution for granular materials (such as granular propellants and some pyrotechnic compositions), checking for coagulation of granular materials, ‘slump’ (particularly in propellants), bulk cracking, and surface cracking/crazing.

b. Thermal analysis methods, especially DSC, are useful tools that may indicate changes in the material over time and are particularly suited to subsequent comparison during In-Service Surveillance. They are applicable to most explosive materials, especially pyrotechnics, since they can be performed on small samples of material.

2.7.5 Mechanical Properties.

Mechanical properties (such as tensile/compressive/shear strength and hardness) of explosive materials must be assessed at the full range of working temperatures for the munition. It will also be necessary to test structural materials at temperature extremes for safety critical items, such as rocket motor cases, in order to verify design safety margins. Typical methods will include uni-axial tensile test in accordance with STANAG 4506 and differential thermal mechanical analysis in accordance with STANAG 4540. It may also be necessary to assess fatigue crack growth for some structural materials. The types of testing will ultimately be determined by the type of material being tested.

ANNEX E. BREAKDOWN TEST AND CRITICAL ANALYSIS (BTCA).

2.7.6 Hazard Properties.

a. Conduct STANAG 4170/AOP-7 small scale material qualification and hazard tests to assess hazard properties for comparison to baseline measurements. These may include, but are not limited to, methods to determine ease of initiation by impact, friction, and electrical spark, along with temperature of ignition.

b. Normally the small scale tests will be sufficient but larger scale tests may also be required if an issue is identified. The exact methods used would depend upon the type and quantity of material available for the tests, but may include ‘gap tests’ and tests to assess Velocity of Detonation. However, they may ultimately require full scale (i.e. AUR) tests to assess the IM properties of the munition following environmental exposure.

2.7.7 Electrical/Electronic Components (if applicable).

a. Where the munition contains electrical sub-assemblies (e.g. electronic safe/arm device, weapon controller, seeker), these should be removed during BTCA for inspection and functional checks. Functional checks should be performed on the sub-assemblies. Where this is not possible or does not allow full testing, then the sub-assembly may require further disassembly to permit such testing.

b. Following this, if possible, full disassembly should be conducted for detailed component level inspection. Specific points to observe are broken/loose joints (connectors and solder), damaged/broken components, damaged/broken circuit board tracks, abraded/broken cables/wiring, corrosion, dendritic growth (e.g. ‘tin whiskers’), condition of ‘potting’ compound (if present), and burst batteries.

c. Electrical resistance of igniters/EID’s (EED’s) should be checked, and EID’s (EED’s) functioned using a normal firing pulse.

2.7.8 Fuze (Mechanical) Components.

a. Where the munition contains a mechanical fuze, this should be removed during BTCA for inspection where possible.

b. If there is any doubt regarding the safe and reliable function of the fuze, or it cannot be demonstrated by alternative means, it may be necessary to carry out tests that simulate the various external stimuli required to arm the fuze (e.g. acceleration, spin).

c. The fuze should be disassembled to determine its internal physical condition and verify its safe condition.

ANNEX F. FACILITIES AND INSTRUMENTATION REQUIREMENTS.

TABLE F-1. FACILITY REQUIREMENTS

ITEM	REQUIREMENT
Inspection and Non-Destructive Test (NDT) Facility	Material inspection equipment such as video borescope, ultrasonic, and radiographic must be available to determine the condition of the munition and its components before and after exposure to environmental tests. Facility should have the capability to conduct radiographic inspection at low temperature extremes or within 15 minutes of removal from a conditioning chamber.
Climatic Test Facility	Climatic chamber equipment capable of temperature conditioning test items to the extremes of -51 to 75 ºC and relative humidity from 5 to 95%. High temperature chamber equipped with solar lamps capable of at least 1120 W/m^2 output.
Dynamic Test Facility	Equipment suitable for simulating the full range of dynamic environments (e.g., transportation vibration, tactical vibration, loose cargo, drop test drop, etc.) expected during the equipment’s lifetime. Facility should have the capability to conduct vibration tests at temperature extremes and drop tests within 15 minutes of removal from a conditioning chamber.
Static Firing Test Facility	Remotely located site capable of measuring motor thrust, pressure, strain, acceleration, and temperature data as a function of time. Facility should have the capability to conduct static firing tests at temperature extremes or within 30 minutes of removal from a conditioning chamber.
Burst Test Facility	Isolated location having remotely controlled pressure generating equipment and capable of measuring pressure and strain data.
Firing Range	Selected to suit missile and rocket test requirements, to capture the required flight test data, and to provide adequate protection for personnel and equipment. Facility should have the capability to conduct the required firing tests at temperature extremes or within 15 minutes of removal from a conditioning chamber.
Warhead Test Area	Test area must have an adequate surface safety danger zone, including overhead air space for open field testing.

ANNEX F. FACILITIES AND INSTRUMENTATION REQUIREMENTS.

TABLE F-1. CONT'D

ITEM	REQUIREMENT
Chemistry Laboratory	Equipment suitable for the evaluation of chemical composition of gas and exudation samples.
BTCA Laboratory	Equipment suitable for the disassembly, sampling, chemical and mechanical test and analysis of explosive and other munition components.
Electromagnetic Environmental Effects (E3) Test Facility	Facility suitable for the generation of field intensities from 10 kHz to 40 GHz and large enough for the round and launch station.
Electrostatic Discharge Test Facility	Facility suitable for the generation of the required ESD environments and large enough for the packaged round.
Obstacle or Battlefield Course	Facility suitable for the collection of operational and human factors data.
Data Collection/Processing Facility	Test data shall be recorded on digital recorders for post-test processing. The data processing system shall edit, display, and print out the desired data plot for analysis and reporting purposes.
Video/Photographic	Closed circuit video is required for personnel safety to permit observation of munition tests. Video camera/recording systems having a sufficient frame rate to record and playback desired events. High speed digital cameras and/or UV/IR cameras may also be required.

TABLE F-2. MEASUREMENT TOLERANCES

DEVICES FOR MEASURING	MEASUREMENT TOLERANCE
Pressure	± 1 percent
Strain	± 1 percent
Thrust (Load Cells)	± 1 percent
Heat Flux	± 1 percent
Resistance (Low Current Circuit Tester/ Squib Tester)	± 0.05 ohms

ANNEX F. FACILITIES AND INSTRUMENTATION REQUIREMENTS.

TABLE F-2. CONT'D

DEVICES FOR MEASURING	MEASUREMENT TOLERANCE
Firing Pulse (Automatic Fire Control System)	As required for the initiation of static fire or burst tests and the automatic sequencing of the data collection systems.
Motor Ignition Events (Video)	Frame rate sufficient to record desired event.
Time	± 1 percent
Temperature Climatic Temperature Measurements Static Fire/Burst Temperature Measurements	 ± 2 ºC ± 5 ºC
Relative Humidity	± 5 percent
Solar Radiation	± 20 W/m^2
Acceleration	± 5 percent over the frequency range
Toxic Gas (NO, NO_2, NO_x, CO, CO_2, SO_2)	2 percent of full scale
Particulates (0.5-15 microns)	2 percent of full scale
Pyrolysis products (fluoride, chloride, bromide, cyanide, aldehydes)	2 percent of full scale
Meteorological Conditions Temperature Relative Humidity Barometric Pressure Ultraviolet (UV) Radiation Potential Lightning/Severe Weather Wind	 ± 2 ºC ± 3 percent ± 0.25 mm of Hg ± 20 W/m^2 > 2 km ± 3 km/hr

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ANNEX G. MARGIN OF SAFETY CALCULATIONS FOR PRESSURE VESSELS.

1. GENERAL.

This annex provides a statistical procedure to determine, at a suitable level of confidence, that the probability of the motor case rupturing is less than some predetermined small value. The probability of case rupture is determined from two measured parameters, the maximum operating pressure of the motor, and the pressure required to rupture the motor case. The reliability of the motor case is estimated by determining the probability that the strength of the motor case exceeds the stresses exerted on the motor case.

2. CONFIDENCE COEFFICIENT.

An estimate of the probability of motor case rupture is determined from a relatively small sample size, which is assumed to be randomly selected from the total population. A confidence interval with an associated confidence coefficient must be defined. The probability of motor case rupture for this document has been set at a "one-sided" confidence interval of 10^{-5} with a confidence coefficient of 90 percent (United States ((US)) requirement).

3. TOLERANCE LIMIT PROCEDURE.

The Tolerance Limit Procedure is used to determine that at a 90 percent level of confidence, the probability of motor case rupture is better than one in 100,000 (the "one-sided" confidence interval of 10^{-5}). This means that the motor case rupture pressure must be much better than the motor operating pressure. The following procedure is based upon the assumptions of independence and normality of the data. The normality of the rupture and operating pressure data can be checked by calculating the skewness and kurtosis values.

4. DEFINITIONS.

a. X = burst pressure.

b. Y = maximum operating pressure.

c. μ_x = mean of the population for X.

d. μ_y = mean of the population for Y.

e. σ_x = standard deviation of the population for X.

f. σ_y = standard deviation of the population for Y.

ANNEX G. MARGIN OF SAFETY CALCULATIONS FOR PRESSURE VESSELS.

g. $\overline{X}$ = average dynamic burst pressure (estimate of μ_x).

h. S_x = standard deviation of burst pressure (estimate of σ_x).

i. n_x = burst pressure sample size.

j. f_x = degrees of freedom of estimate S_x.

k. $\overline{Y}$ = average static fire maximum operating pressure (estimate of μ_y).

l. S_y = standard deviation of the maximum operating pressure (estimate of σ_y).

m. n_y = maximum operating pressure sample size.

n. f_y = degrees of freedom of estimate S_y.

o. f_{x-y} = degrees of freedom for X and Y.

p. S_{x-y} = standard deviation of the difference X – Y.

and

$$\overline{X-Y} = \overline{X} - \overline{Y} \tag{G1}$$

$$S_{x-y}^2 = S_x^2 + S_y^2 \tag{G2}$$

q. When applying tolerance limits to determine the probability that X-Y>0, it is necessary to determine a sample size, n_{x-y}, to be used in the computation. If $n_x = n_y$, then set $n_{x-y} = n_x = n_y$. If n_x does not equal n_y, then the following shall be used to determine n_{x-y}:

$$n_{x-y} = \frac{s_x^2 + s_y^2}{\frac{S_x^2}{n_x} + \frac{S_y^2}{n_y}} \tag{G3}$$

r. The procedure used to determine equation G3 is as follows:

s. The t-test for the equality of two means with unequal variances is:

ANNEX G. MARGIN OF SAFETY CALCULATIONS FOR PRESSURE VESSELS.

$$t = \frac{(\bar{x} - \bar{y}) - (\mu_x - \mu_y)}{\left[\frac{S_x^2}{n_x} + \frac{S_y^2}{n_y}\right]^{1/2}} \qquad \text{(G3a)}$$

t. If $n_x = n_y = n$, the formula becomes:

$$t = \frac{(\bar{x} - \bar{y}) - (\mu_x - \mu_y)}{\left[\frac{S_x^2 + S_y^2}{n}\right]^{1/2}} \qquad \text{(G3b)}$$

u. Equating the two formulas G3a and G3b and solving for n results in equation G3.

v. The above procedure cannot be considered more than a plausible reason for equation G3, however, equation G3 does have the following desirable attributes:

(1) If $n_x = n_y$, then $n_{x\text{-}y} = n_x = n_y$.

(2) If $S_x = S_y$, then $n_{x\text{-}y}$ is the harmonic mean of n_x and n_y.

(3) $n_{x\text{-}y}$ is bound by n_x and n_y.

(4) If $S_x > S_y$, then $n_{x\text{-}y}$ will be closer to n_x, and this is desirable since the larger S has the greater influence on $S_{x\text{-}y}$ in equation G2. The degrees of freedom for X and Y are:

$$f_{x-y} = \frac{(s_x^2 + s_y^2)^2}{\frac{S_x^4}{f_x + 2} + \frac{S_y^4}{f_y + 2}} - 2 \qquad \text{(G4)}$$

w. The differences in pressure in multiples of standard deviations are:

$$K = \frac{(\bar{x} - \bar{y})}{[s_x^2 + s_y^2]^{1/2}} \qquad \text{(G5)}$$

x. From the computed values of equations G3, G4, and G5 and by using the One-Sided Tolerance Limit tables of values of k for various values of n, the probability of (X-Y)>0 can be determined.

ANNEX G. MARGIN OF SAFETY CALCULATIONS FOR PRESSURE VESSELS.

5. OPERATING CHARACTERISTICS CURVES.

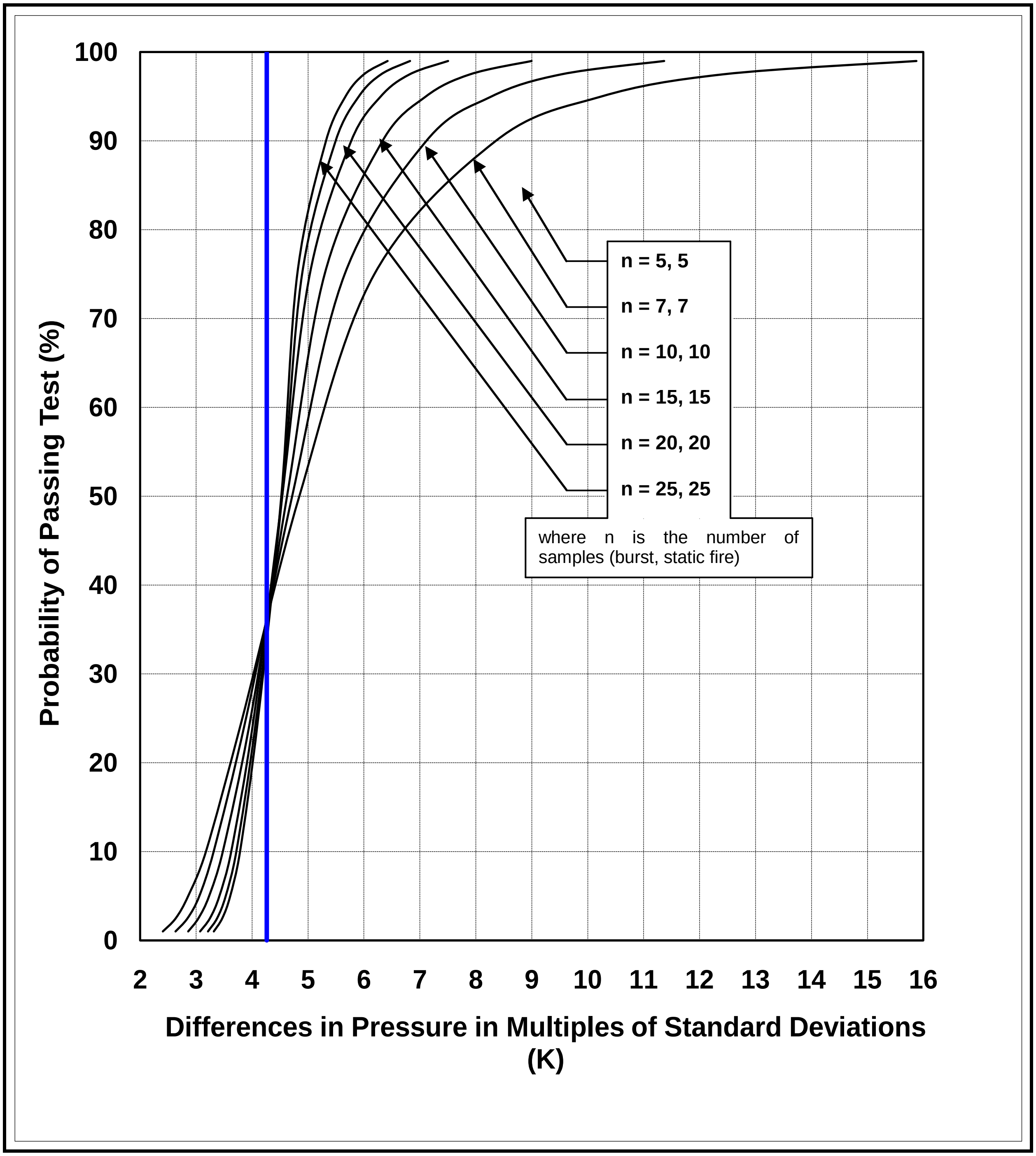
a. The operating characteristics curves in Figure G-1 show how the power of the test using the Tolerance Limit Procedure varies with sample size. The numbers associated with each curve denote the sample sizes to be used to measure case burst pressure and maximum generated operating pressure. The abscissa of the figure is the ratio:

$$K = \frac{(\overline{x} - \overline{y})}{[s_x^2 + s_y^2]^{1/2}}$$

b. This ratio has been used because, for a given sample size, the probability of passing the test depends on the ratio rather than on the absolute difference between the mean pressures. The vertical line in the figure is drawn at the criterion level of 4.26489, where the true probability of case rupture is 1/100,000.

c. The test depicted in Figure G-1 is designed with a consumer or Type I risk of 35 percent and criterion level of 4.26489. As one can see from the figure, the motor must be better than the criterion to have much chance of passing the test. Also, the criterion shows how the power of the test to discriminate between good and bad units increases as the sample size is increased. The curves in Figure G-1 may also be used to estimate the level of extra safety that will have to be built into the units to ensure a high probability of passing the test. For example, if 10 units are to be used for testing (5 for burst pressure, 5 for maximum pressure) then to ensure an 80 percent chance of passing the test, it would be necessary to build units with a pressure difference of approximately 6.75 times as large as the standard deviation of the estimate of the difference. On the other hand, the pressure difference would only have to be approximately 5.50 times as large if 20 units were to be used for testing.

ANNEX G. MARGIN OF SAFETY CALCULATIONS FOR PRESSURE VESSELS.



$$K = \frac{\bar{X} - \bar{Y}}{\sqrt{S_x^2 + S_y^2}}$$

Figure G1. Operating characteristic curves (one-sided tolerance limits).

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ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

This annex provides descriptions of all of the non-sequential tests required in the S3 Test Programs included in Annex B. Rationale for these tests are provided in Annex A.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 1. ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E3) TESTS.

1. HAZARDS OF ELCTROMAGNETIC RADIATION TO ORDNANCE (HERO).

Conduct the HERO test using guidance in AECTP 500, Category 508, Leaflet 3, and the parameters found in all LCEP configurations. HERO tests are performed using one complete inert munition with instrumented inert EIDs and/or ESADs. The HERO tests generally use an electric measuring chain (instrumented EIDs) that will collect measured induced stimulus data. The instrumented EIDs have a thermal sensor placed near them to measure the slightest change in temperature, which is then translated into induced current and a safety margin is calculated in accordance with AECTP 500, Category 508, Leaflet 3. In case other EIDs (e.g., EEDs, gap initiators, and exploding foil initiators ((EFIs)) are used, it is acceptable to conduct tests without instrumentation, but a considerably higher number of units and a theoretical analysis will be required; or the margin must be placed on the test environment for GO-NO-GO testing of live EID’s. Therefore, for non-instrumented devices, six EID's or ESAD's are required for this test per Annex B, and the analysis or higher test environment is required.

2. ELECTROSTATIC DISCHARGE (ESD) TESTS.

2.1 Personnel Handling.

a. Personnel handling ESD tests are performed using an inert munition, which contains inert or live EID's/ESAD's. A minimum of 20 complete sets of EID's/ESAD's are required (see Annex B).

b. Conduct personnel handling ESD tests using guidance in AECTP 500, Category 508, Leaflet 2. The discharge is applied to all connectors (protective covers removed) and electronics accessible during system checks and/or field assembly. ESAD's shall be tested while in the functional mode.

c. Inspect and test all EID’s/ESAD's for activation.

2.2 Helicopter-Borne Transportation.

a. Helicopter-borne transportation ESD tests are performed using an inert munition, which contains inert or live EID's/ESAD's. A minimum of 10 complete sets of EID's/ESAD's are required (see Annex B).

b. Conduct helicopter-borne transportation ESD tests using AECTP 500, Category 508, Leaflet 2.

c. Inspect and test all EID’s/ESAD's for activation.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 1. ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E3) TESTS.

3. LIGHTNING HAZARD.

a. The tests are performed with the munition in the worst case configuration based on analysis of the LCEP scenario.

b. One complete, live munition is subjected to indirect and direct lightning strike tests.

c. Additional indirect or direct lightning tests shall be performed using inert munitions with instrumented inert or live EID’s/ESAD's. A minimum of 20 complete sets of EID’s/ESAD's (10 for indirect lightning strike and 10 for direct lightning strike) are required to provide adequate data when instrumented components are not available (see Annex B).

d. Perform the lightning strike tests using the parameters found in AECTP 500, Category 508, Leaflet 4.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 2. HEALTH HAZARD TESTS/ASSESSMENTS.

Health hazard data is to be collected during the AUR Level Firing Tests (see Annex D, Appendix 1). The hazards to be assessed for shoulder launched munitions are described below.

1. ACOUSTIC ENERGY (IMPULSE NOISE AND BLAST OVERPRESSURE).

During AUR Level Firing tests, measure blast overpressure and acoustic noise to determine if the shock wave damages structures and/or injures personnel (especially hearing). Mount the shoulder launched weapon in a test firing fixture with the weapon at the normal firing elevation. The firing position shall be free of any extraneous structures. Position blast overpressure and microphone sensors at the operator's head, and at locations around the weapon. Fire the munition. Record and analyse impulse noise measurement data.

2. TOXIC CHEMICAL SUBSTANCES (ROCKET EXHAUST GASES).

Collect and analyze toxic chemical data during firing tests. Pretest analysis is recommend to determine most likely combustion products (gaseous and particulate) and their concentrations. The test design should encompass configurations most likely to produce the greatest toxic fume hazards. Gas concentrations for CO, CO_2, SO_2, NO, NO_2, and HCl shall be measured at the operator's face and at other strategic locations. The resulting values should be presented in the form of concentration versus time curves and integrated over time to produce the equivalent exposure. The toxic substances under review must be examined by toxicologists, human factors engineers, physicians, and/or ecologists for potential human (exposure time and dose) health hazards. These hazards shall be evaluated with respect to the envisaged operational environment and on the basis of pertinent national laws and regulations.

3. RADIATING ENERGY.

During AUR dynamic firing tests, install radiometric sensors in the operator's eye positions (including one at the operator's eyepiece and any observer location, as applicable) and aim them along the flight path of the munition. Deploy photometrically calibrated detectors for several firings as above. Radiometric data that contain visible spectrum levels may be reduced to provide photometric data. Obtain heat flux measurements at the operator's face position.

4. LAUNCH SHOCK (RECOIL).

Mount accelerometer and displacement sensors on the munition and the firing fixture to determine shock levels due to weapon firing and recoil.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 2. HEALTH HAZARD TESTS/ASSESSMENTS.

5. LAUNCH DEBRIS.

Determine launch debris patterns, velocities, sizes, and masses using soft media fragment collection packs and high speed cameras during the dynamic firings. Collect these data outside of the operator's position to define the launch space that is unsafe for occupancy during firings.

6. OXYGEN STARVATION.

During the Fire from Enclosure test, measure oxygen levels during and after the firing.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 3. OPERATIONAL AND MAINTENANCE (O&M) ASSESSMENT.

Operational tests assess the safety of operational and maintenance procedures and equipment during field handling exercises. Human Factors Engineers shall be involved in the planning, conduct, and evaluation of the following tests.

1. OPERATIONAL AND MAINTENANCE SIMULATION.

Soldiers using inert munitions and non-maintenance support items perform tactical transportation, system handling, and firing operations tests under simulated battlefield conditions. Human Factors Engineering (HFE) tests during simulated firing missions include setup, built-in test equipment (BITE) checks, munition loading, and simulated firings. The operators perform target acquisition and tracking tests to determine any operational limits. Training exercises are performed with the complete training package. The operator manuals are reviewed and followed during the above. Operators wear temperate weather and arctic clothing and nuclear, biological, chemical (NBC) masks and clothing. The tester will consider performing a low-temperature (cold room) operational test to assess the Soldier’s ability to operate the weapon with protective gear. Live munitions may be used once enough testing has been completed to satisfy the safety authorities that the system is safe for use. Review and exercise the system support package (SSP). Assess the safety of preventive and corrective maintenance operations up to depot level. Simulated system faults may be used to exercise test sets and other test, measurement, and diagnostic equipment. Use maintenance manuals for these exercises and evaluate them in terms of safety.

2. HUMAN ERROR CHECKLIST.

Develop a checklist of "Common Sources of Human Error" to categorize human errors that occur during operational tests and to suggest potentially hazardous human errors that apply to the system. Develop additional safety checklists to address electrical, mechanical, and miscellaneous safety items. Information for developing this checklist is specified in STANAG 7201.

3. OPERATIONAL AND MAINTENANCE REPORT.

Record, describe, and score actual and potential unsafe operations and maintenance practices by using observations, video records, checklists, measurements, and operator and maintainer debriefings. Note, the experience and impressions gained by the test persons during handling of the equipment should be recorded during and/or immediately after the tests. This could be done best in the form of standardized interviews made by persons who are experienced in social sciences (e.g., HFE Engineers) using a catalog of previously determined questions. The interview results shall be evaluated based on social science criteria (statistical evaluation, etc.).

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 3. OPERATIONAL AND MAINTENANCE (O&M) ASSESSMENT.

4. EMITTED RADIATION (IF APPLICABLE).

4.1 Control Methods.

Review existing data on system high-power emitters, including radio or radar band transmitters, non-coherent or coherent (laser) infrared, visible, and ultraviolet band transmitters, etc., and include radioactive sources such as optical lenses, indicators, references, etc., against appropriate safety standards. Review the methods used to control these emitters, including safety devices and operational and maintenance safety procedures.

4.2 Radiation Protection Procedures.

Non-ionizing radiation measurements are performed to provide a health hazard assessment. Special precautions may be required for items that produce ionizing radiation. For example, it may be necessary to control the exposure of personnel to the radiation. Consult with the installation Radiation Protection Officer during the test planning phase to develop radiation protection procedures for these emitters. Verify the emission characteristics of these devices, to include mapping of levels at operator or maintainer positions, if applicable.

4.3 Inadvertent Activation.

Test and analyze operations, which inadvertently trigger the emitter or change its output characteristics such as operator error, electromagnetic radiation (EMR), climatic and dynamic environments, improper installation, interlock bypass, etc. Test and assess shields as necessary.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 4. NON-SEQUENTIAL OPERATING TESTS.

WARHEAD ARENA TRIALS.

Warhead arena trials are performed to determine safe separation distances and range safety parameters. These trials should be conducted with non-sequential, factory fresh warheads unless it can be shown that exposure to thermal and dynamic stresses in the Sequential Environmental Test Sequence results in an increase in fragmentation distance. Guidance for this test can be found in ITOP 04-2-813.

a. Perform this test on four or six (depending on munition type) individual warheads at ambient temperature.

b. Warhead arena trials require the use of the warhead only. However, the tester should evaluate whether components directly attached to the warhead or in the immediate area of the warhead, either by design or by inadvertent action, could significantly affect the warhead's fragment dispersion pattern.

c. Place the item in the instrumented arena and detonate the warhead.

d. Determine warhead fragment size, velocity, mass, spatial distribution, and levels of noise and blast pressure.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 5. NON-SEQUENTIAL DYNAMIC TESTS.

LOGISTIC DROP.

This mandatory logistic drop test, as described in STANAG 4375, assesses the safety of the weapon when exposed to a free-fall drop which may be encountered during ship loading operations.

a. Test Temperature.

Temperature condition the munition prior to conducting the logistic drop tests. Stabilize all designated cold items to a temperature of -46 ºC. Stabilize all designated hot munitions to the packaged SRE temperature. Drop tests should be conducted within 30 minutes of removal from the conditioned environment.

b. Munition Configuration.

This test should be conducted as a non-sequential, factory-fresh munition packaged in the logistic container.

c. Test Procedure.

Conduct one handling drop test on each drop test munition from a height of 12 meters onto a concrete supported steel surface. The drop test should be conducted in accordance with STANAG 4375.

d. Drop Orientation.

The test item is to be released such that it will approximate an initial impact in one of the following orientations:

(1) Major axis vertical, nose up.

(2) Major axis vertical, nose down.

(3) Major axis horizontal.

e. The sample size shall be subdivided to ensure at least one impact occurs in each of the most severe orientations in terms of the potential reaction of the munition.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 6. NON-SEQUENTIAL CLIMATIC TESTS.

1. MOLD GROWTH.

Perform per AECTP 300, Method 308 on the munitions in the unpackaged configuration for a minimum of 28 days. This test should be conducted as a non-sequential test.

2. CONTAMINATION BY FLUIDS.

Perform per AECTP 300, Method 314 on the munition in the unpackaged configuration. Test requirements are to be tailored according to the materials on the test article. This test should be conducted as a non-sequential test.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 7. OTHER SAFETY TESTS/ASSESSMENTS TO BE CONSIDERED.

Additional safety tests should be performed if data from previous testing indicate that further investigation is required. Selection is based on analysis and previous test results, including evidence of incipient failure modes. Hardware sample sizes depend on the nature of the tests.

1. INDUCED FAILURE FIRING TESTS.

When required, additional confidence in the safety of the munition may be obtained by conducting tests, wherein failures are induced in munitions, sections of munitions, munition components, and launch stations before or during the firings to investigate personnel hazards and hazard area boundaries. The induced failure conditions listed below investigate the hazards created by possible design weaknesses and evaluate potential hazards identified during previous tests. Hazards caused by operator error may be used to select the types of induced failures based on the operational and maintenance tests of Annex H, Appendix 3. Evaluate all possible conditions that may cause premature launch, misfire, hang-fire, and catastrophic failure of propellant devices and warhead. Examples of induced failures to consider are:

a. Cracked or unbonded propellant grains.

b. Plugged propellant device nozzles.

c. Damaged or incorrectly installed propellant grain supports or insulation.

d. Loose propellant case components.

e. Damaged igniter.

f. Misaligned components.

g. Damaged umbilical.

h. Damaged munition restraint devices.

i. Short or open in fire control circuit.

j. Damaged or incorrectly installed fuze or S&A device.

k. Damaged or incorrectly installed safety shields or launch tubes.

l. Corrosion in critical electrical connections or interfaces.

m. Incompatibility of missile components to chemicals.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 7. OTHER SAFETY TESTS/ASSESSMENTS TO BE CONSIDERED.

n. Defective electrical grounding systems.

2. EXTENDED TEMPERATURE CYCLE.

Some energetic materials may crack during low-temperature cycling causing potentially unsafe conditions (e.g. dangerous internal operating pressures in rocket motors). Further rationale is given in Annex A.

a. When required, perform the extended temperature cycling test on two separate units (either component or assembled munition). Seal these units against moisture if they or the munition are sealed in the shipping, storage, or tactical configuration.

b. Subject the units to 20 diurnal cycles between 10 ºC and -51 ºC. Dwell at high and low temperatures for 4 hours, with 8-hour ramps between temperature extremes.

c. The two units are radiographed to determine if cracking or separation has occurred. Static fire the units at operational temperature extremes to assess potential safety hazards.

3. LONG-TERM STORAGE.

At a minimum, all explosive materials in a munition shall undergo appropriate testing and assessment per STANAG 4170 and AOP-7 to determine whether each possesses properties which make it safe for consideration for use in its intended role. In addition, energetic components may be subjected to extended diurnal cycling storage tests using guidance in STANAG 4370, AECTP 300. This test will thermo-mechanically stress the item yielding information that might identify potential failure modes and future safety problems. A full BTCA inspection in accordance with Annex E should be conducted following the long-term storage test.

4. THERMAL STABILITY.

This test is designed to evaluate the thermal stability of the munition to elevated thermal conditions, to determine whether it is too hazardous for transport. The munition may be tested bare or in its logistic container. Gradually raise the temperature of the test munition to 75 ± 2 ºC and hold for 48 hours in a chamber equipped with ventilation and explosion proof electrical features. Place a thermocouple either on the outside casing of the unpackaged munition or on the outside casing of the munition that is located near the center of the package. Record the temperature at a minimum of one minute intervals in order to assess any temperature increase that could represent an exothermic reaction. If no reaction occurs, allow the munition to cool to

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 7. OTHER SAFETY TESTS/ASSESSMENTS TO BE CONSIDERED.

ambient before inspecting for exudation or damage. Additional information is located in United Nations (UN) ST/SC/AC.10/1. The test item is considered too hazardous for transport if any of the following occur:

a. It explodes.

b. It ignites.

c. It generates colored fumes or odor.

d. It experiences a temperature rise exceeding 3 ºC.

e. The outside casing of the munition or its container is damaged.

f. For hypergolic munitions, either fuel or oxidizer leaks from its primary storage tank.

5. <u>OPERATOR SAFETY</u>.

This test assesses the rearward effects on the operator in the event a missile is mistakenly fired into a barrier before the warhead has armed. One item shall be tested at ambient temperature. The item shall be launched into a concrete barrier, which is positioned before the minimum arming distance. The change in kinetic energy shall not cause the warhead to function or any other explosive event to occur that would endanger the operator. The item may be assembled from leftover safety assessment test components, or if necessary, one of the fuze arming test assets (Annex D, Appendix 1, paragraph 2) may be utilized for this test.

6. <u>BALLISTIC SHOCK</u>.

a. Test Temperature.

Stabilize all cold munitions to -46 ºC and all hot munitions to the unpackaged SRE temperature prior to vibration testing. Test temperature is to be maintained throughout testing.

b. Munition Configuration.

This test should be conducted with the munitions in the combat transport and tie-down configuration.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 7. OTHER SAFETY TESTS/ASSESSMENTS TO BE CONSIDERED.

c. Test Level.

Test items in the tactical transport and tie-down configuration in accordance with AECTP 400, Method 422, Procedure III or V.

7. WARHEAD FUZE SENSITIVITY.

Fuze sensitivity tests determine whether or not the fuze functions on impact with light brush or other obstruction in close proximity to the firing crew. A fly-through panel is placed at predetermined distances to simulate obstructions. AOP-20 provides details on this and other fuze sensitivity tests. Some of the munitions may be fired at extreme temperatures.

8. HIGH VELOCITY PARACHUTE DROP.

Munitions that may be re-supplied by high-velocity parachute delivery and are expected to remain S3 following such an event. Per AOP-20, test E5, high velocity parachute systems may result in impact velocities of 27.4 m/s (90 ft/sec). This test should be conducted as a non-sequential test on a minimum of three munitions with live fuzes (other energetic components may be inert).

a. Test Temperature.

The high velocity parachute drop is conducted at ambient temperature.

b. Test Configuration.

High velocity parachute drops occur in bulk munition (palletized) configuration with appropriate supplemental shock isolation commonly used for parachute drop operations. At a minimum, three munitions are to be dropped once each nose up, nose down, or sideways.

c. Drop Height.

In order to achieve the impact velocity of 27.4 m/s (90 ft/sec), this environment is commonly replicated by a 41 m (135 ft) freefall drop unless specific and validated evidence is presented to the contrary.

d. Number of Drops.

It is not expected that a munition would be dropped more than once from this extreme height during its service life; thus, only one drop is required.

ANNEX H. NON-SEQUENTIAL TESTS/ASSESSMENTS.

APPENDIX 7. OTHER SAFETY TESTS/ASSESSMENTS TO BE CONSIDERED.

9. MALFUNCTIONING PARACHUTE DROP.

Munitions that may be re-supplied by parachute delivery are at risk of a malfunctioning parachute drop scenario and are expected to remain safe for disposal. Per AOP-20, test E5, malfunctioning parachute systems may result in impact velocities of 45.7 m/s (150 ft/sec). This test should be conducted as a non-sequential test on a total of three munitions with live fuzes (other energetic components may be inert).

a. Test Temperature.

The malfunctioning parachute drop is conducted at ambient temperature.

b. Test Configuration.

Malfunctioning parachute drops occur in bulk munition (palletized) configuration with appropriate supplemental shock isolation commonly used for parachute drop operations. At a minimum, three munitions are to be dropped once each nose up, nose down, or sideways.

c. Drop Height.

In order to achieve the impact velocity of 45.7 m/s (150 ft/sec), this environment is commonly replicated by a 116 m (380 ft) freefall drop unless specific and validated evidence is presented to the contrary.

d. Number of Drops.

It is not expected that a munition would be dropped more than once from this extreme height during its service life; thus, only one drop is required.

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ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

Appendix 1 – Abbreviations
Appendix 2 – References
Appendix 3 – Related Documents

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 1. ABBREVIATIONS.

AECTP	Allied Environmental Conditions Test Publication
AAS3P	Allied AmmunitionSafety and Suitability for Service Publication
ANEP	Allied Navy Engineering Publication
AOP	Allied Ordnance Publication
ARSP	Allied Range Safety Publication
AP	Allied Publication
AUR	All-Up-Round
BIT	built-in test
BITE	built-in test equipment
BTCA	Breakdown Test and Critical Analysis
°C	degrees celsius
cm	centimeter
CT	computed tomography
DEF STAN	Defence Standard
DSC	differential scanning calorimetry
E3	electromagnetic environmental effects
EED	electroexplosive device
EFI	exploding foil initiator
EID	electrically initiated device
EMR	electromagnetic radiation
EMRH	electromagnetic radiation hazards
EMROH	electromagnetic radiation operation hazards
EOD	explosive ordnance disposal
ESAD	electronic safe and arm device
ESD	electrostatic discharge

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 1. ABBREVIATIONS.

FMECA	Failure Modes and Criticality Effects Analysis
FTA	Fault Tree Analysis
FR	France
GE	Germany
HERO	Hazards to Electromagnetic Radiation to Ordnance
HFE	Human Factors Engineer
hr	hour
Hz	Hertz
IM	insensitive munition
ISO	International Standards Organization
ITOP	International Test Operations Procedure
JOTP	Joint Ordnance Test Procedure
km	kilometer
LCEP	Life Cycle Environmental Profile
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
mm	millimeter
m	meter
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NDT	non-destructive test
S3	Safe and Suitable for Service
S&A	safe and arming (device)
SAR	safety assessment report

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 1. ABBREVIATIONS.

SRE	solar radiation equivalent
SRS	shock response spectra
SSP	system support package
STANAG	NATO Standardization Agreement
TOP	Test Operations Procedure
TWV	Tactical Wheeled Vehicle
TWT	Two Wheeled Trailer
UK	United Kingdom
UN	United Nations
UNDEX	underwater explosion
US	United States
UV	ultraviolet

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CROSS-REFERENCE TABLE

	SHORT TITLE	NATO	US	UK	FR	GE
1	Munitions Safety Testing	STANAG 4629	ITOP 05-2-619. MIL-STD-2105. MIL-STD-882		ITOP 05-2-619	ITOP 05-2-619
2	Environmental Testing	STANAG 4370, AECTP's 100, 200, 230, 240, 300, 400	MIL-STD-810	Def Stan 00-35	STANAG 4370 GAM EG-13	DIN IEC-68, VG 95210
2a	Humid Heat	AECTP 300, Method 306, Procedure 1, Cycle 3	MIL-STD-810, Method 507, Procedure I, Cycle B3	Def Stan 00-35, Part 3, Test CL6 Severity from Def Stan 00-35 Part 4 Ch2-01	AECTP 300, Method 306	
2b	Low Temperature Storage	AECTP 300, Method 303, Procedure 1	MIL-STD-810, Method 502, Procedure I	Def Stan 00-35, Part 3, Test CL5 Severity from Def Stan 00-35 Part 4 Ch2-01	AECTP 300, Method 303	
2c	High Temp Storage	AECTP 300, Method 302, Procedure 1	MIL-STD-810, Method 501, Procedure I	Def Stan 00-35, Part 3, Test CL6 (for high humidity) & CL2 (for low humidity) Severity from Def Stan 00-35 Part 4 Ch2-01 if cyclic.	AECTP 300, Method 302	
2d	High Temperature Cycle	AECTP 300, Method 302, Procedure 1, Category A1	MIL-STD-810, Method 501, Procedure II, Category A1	Def Stan 00-35, Part 3, Test CL6 (for high humidity) & CL2 (for low humidity) Severity from Def Stan 00-35 Part 4 Ch2-01	AECTP 300, Method 302	
2e	Solar Radiation	AECTP 300, Method 305, Procedure 1, Category A1	MIL-STD-810, Method 505, Procedure I, Category A1	Def Stan 00-35, Part 3, Test CL3	AECTP 300, Method 305	
2f	Thermal Shock	AECTP 300, Method 304, Procedure 1	MIL-STD-810, Method 503, Procedure I-C	Def Stan 00-35, Part 3, Test CL14 Procedure A	AECTP 300, Method 304	

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CONT'D

	SHORT TITLE	NATO	US	UK	FR	GE
2g	Immersion	AECTP 300, Method 307	MIL-STD-810, Method 512	Def Stan 00-35, Part 3, Test CL29 Procedure A or B	AECTP 300, Method 307	
2h	Salt Fog	AECTP 300, Method 309	MIL-STD-810, Method 509	Def Stan 00-35, Part 3, Test CN2 Salt Corrosion	AECTP 300, Method 309	
2i	Sand and Dust	AECTP 300, Method 313, Procedures 1 and 2	MIL-STD-810, Method 510, Procedures I and II	Def Stan 00-35, Part 3, Test CL25 Wind Blown Dust & Sand	AECTP 300, Method 313	
2j	Rain/Watertightness	AECTP 300, Method 310, Procedure 1 (rain)	MIL-STD-810, Method 506, Procedure I	Def Stan 00-35, Part 3, Test CL27	AECTP 300, Method 310	
2k	Low Pressure (Altitude)	AECTP 300, Method 312, Procedure 3 (rapid decompression)	MIL-STD-810, Method 500, Procedure III	Def Stan 00-35, Part 3, Test CL9	AECTP 300, Method 312	
2l	Common Carrier Vibration	AECTP 400, Method 401	MIL-STD-810, Method 514, Category 4	Def Stan 00-35, Part 3, Test M1 (using Fig A1)	AECTP 400, Method 401	
2m	Packaged Transit Drop	AECTP 400, Method 414, Procedure 1	MIL-STD-810, Method 516, Procedure II	Def Stan 00-35, Part 3, Test M5	AECTP 400, Method 414	
2n	Wheeled Vehicle Transport, Secured Cargo (Tactical Wheeled Vehicle and Two-Wheeled Trailer)	AECTP 400, Method 401	MIL-STD-810, Method 514, Category 4	Def Stan 00-35, Part 3, Test M1 (using Fig A1)	AECTP 400, Method 401	
2o	Loose Cargo	AECTP 400Method 406, Procedure 1 or 2	MIL-STD-810, Method 514, Category 5	Def Stan 00-35, Part 3, Test M11	AECTP 400 Method 406	
2p	Tracked Vehicle	AECTP 400, Method 401	MIL-STD-810, Method 514, Category 4	Def Stan 00-35, Part 3, Test M1 (using Figs A26 & A27 for APC)	AECTP 400, Method 401	
2q	Restrained Cargo Transport Shock	AECTP 400, Method 417	MIL-STD-810, Method 514, Category 4	Def Stan 00-35, Part 3, Test M3 (using Table 2)	AECTP 400, Method 417	
2r	Unpackaged Transit Drop	AECTP 400, Method 414, Procedure 1	MIL-STD-810, Method 516, Procedure IV	Def Stan 00-35, Part 3, Test M5	AECTP 400, Method 414	

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CONT'D

	SHORT TITLE	NATO	US	UK	FR	GE
2s	Air Transportation, Fixed Wing	AECTP 400, Method 401	MIL-STD-810, Method 514, Category 7 and 8	Def Stan 00-35, Part 3, Test M1 (using Figs A5 to A14)	AECTP 400, Method 401	
2t	Air Transportation, Helicopter Cargo	AECTP 400, Method 401	MIL-STD-810, Method 514, Category 9	Def Stan 00-35, Part 3, Test M1 (using Figs 15 to A18)	AECTP 400, Method 401	
3	Vibration Test Schedule Development	STANAG 4370, AECTP 240 Leaflet 2410	ITOP 01-1-050	Def Stan 00-35, Part 5	STANAG 4370 AECTP 240	
4	Vibration Test Schedules	STANAG 4370, AECTP 400	ITOP 01-2-601	Def Stan 00-35, Part 3, Test M1, Annex A	STANAG 4370, AECTP 400	DIN IEC-68, VG 9521
5	Logistic Drop Test (12m drop)	STANAG 4375	ITOP 04-2-601, JOTP-001, MIL-STD-648	STANAG 4375	STANAG 4375	
6	Rough Handling Drop Test	STANAG 4370, AECTP 400	ITOP 04-2-602	Def Stan 00-35, Part 3, Test M5	STANAG 4370 AECTP 400	
7	Under Water Explosion	ANEP 43, STANAG 4549, STANAG 4150	ANEP 43, MIL-S-901	Def Stan 00-35, Part 3, Test M7 (or Test M3) for UNDEX shock.		
8	Fire From Enclosure		ITOP 05-2-517			
9	Fuze Safety Tests	STANAG 4157, AOP-20 STANAG 4363, AOP-21 STANAG 4187	MIL-STD-331, MIL-STD 1316	STANAG 4157, AOP-20 STANAG 4363, AOP-21	Tailored Test Methods + AOP-20	
10	Warhead Minimum Arming Distance	STANAG 4157, AOP-20 STANAG 4363, AOP-21	ITOP 04-2-806	STANAG 4157, AOP-20 STANAG 4363, AOP-21	STANAG 4157, AOP-20	
11	Rocket Motor Static Firing		ITOP 05-2-500	Def Stan 07-85		TL1376-0701
12	Rocket Motor Case Burst		ITOP 05-2-621			
13	Warhead Arena Test		MEM NA 00-130ASR-2-1 (Army FM 101-51-3-CD (EM 0260))			
14	Explosive Material Qualification	STANAG 4170, AOP-7	STANAG 4170, AOP-7	STANAG 4170, AOP-7	STANAG 4170 AOP-7 S-CAT 17500	

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CONT'D

	SHORT TITLE	NATO	US	UK	FR	GE
15	Electromagnetic Environmental Effects (tests)	STANAG 4370, AECTP 500	MIL-STD-464, TOP 01-2-511, MIL-STD-461	Def Stan 59-411 AECTP 500	GAM DRAM 02	VG 95370, VG 95379
16	Electromagnetic Environmental Effects (HERO)	STANAG 4370, AECTP 508 Leaflet 3	MIL-STD-464, MIL-HDBK-240, OP 3565	AECTP 508 Def Stan 59-411 OB Pillar Proc 101	GAM DRAM 02	
17	Electromagnetic Environmental Effects (environment description)	STANAG 4370, AECTP 250 Leaflet 258	MIL-STD-464, STANAG 4370, AECTP 250 Leaflet 258 RF, MIL-HDBK-235	Def Stan 59-411 AECTP 250	GAM DRAM 01	
18	Electrostatic Discharge Environmental Test	STANAG 4370, AECTP 250 Leaflet 253 AECTP 508 Leaflet 2	MIL-STD-464 STANAG 4370, AECTP 250 Leaflet 253	Def Stan 59-411 AECTP 508 Leaflet 2	GAM DRAM 01 GAM DRAM 02	VG 95378
19	Lightning Environmental Test	STANAG 4370, AECTP 508 Leaflet 4, AECTP 250 Leaflet 254	MIL-STD-464 STANAG 4370, AECTP 508 Leaflet 4 AECTP 250 Leaflet 254	Def Stan 59-411 AECTP 508 Leaflet 4	GAM DRAM 01 GAM DRAM 02	
20	Insensitive Munitions Tests	STANAG's 4240, 4241, 4382, 4396, 4496	MIL-STD-2105	STANAG's 4240, 4241, 4382, 4396, 4496 UN Manual of Tests & Criteria – Test Series 7	STANAG's 4240, 4241, 4382, 4396, 4496	STANAG's 4240, 4241, 4382, 4396, 4496
21	Insensitive Munitions Assessment	AOP-39, STANAG 4439	AOP-39 STANAG 4439	AOP-39 STANAG 4439	AOP-39	ZDv 34/250, DIN EN 61508
22	Hazardous Material Classification	STANAG 4123, AASTP-3	TB 700-2 UN ST/SG/AC/10/1	Joint Services Publication 482 Chapter 4 UN Manual of Tests & Criteria	UN ST/SG/AC 10/1	
23	Hazardous Material Classification (Thermal Stability)	UN ST/SC/AC/10/1	UN ST/SG/AC/10/1	Joint Services Publication 482 UN Manual of Tests & Criteria	UN ST/SG/AC 10/1	
24	Electromagnetic Interference	STANAG 4370, AECTP 501	MIL-STD-461	Def Stan 59-411	STANAG 4370	VG 95373

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CONT'D

	SHORT TITLE	NATO	US	UK	FR	GE
25	Software Safety	AOP-52	ITOP 01-1-057, QAP-268	Def Stan 00-56, AOP-52	AOP-52	VG 95373, DIN EN 61508
26	Human Factors	STANAG 7201	TOP 01-1-015, TOP 01-2-610, MIL-HDBK-46855A, MIL-STD-1472	Def Stan 00-25	DGA/NO/FHG/913	VG 95115 ZDv 90/20 HdE
27	Toxic Gas / Materials		ITOP 05-2-502			Erl. BMVg InSan I4-42-19-01 ITOP 05-2-502
28	Weapon Danger Area	STANAG 2240, STANAG 2401, ARSP-1, ARSP-2	ITOP 05-2-505	STANAG 2240, STANAG 2401, ARSP-1, ARSP-2	TTA206 STANAG 2921	STANAG 2244, 2401, ARSP-1 Vol I and II, ZDv44/10
29	System Safety	AOP-15	MIL-STD-882, MIL-HDBK-764	Def Stan 00-56	AOP-15	VG 95373, DIN EN 61508
30	Acoustic Noise		MIL-STD-1474, ISO 10843: 1997	Def Stan 00-27	AT-83/27/28	ZDv 90/20 VM Blatt 1993: Larmschutz in der Bw-Neufassung Vorschriften und Richtlinien zur Registrierung und Auswertung von Waffen-und Detonationsknallen
31	Motor Case Burst Probability		ARO Report 75-2, SMC-S-001	Def Stan 07-85		
32	Global Climatic Data	STANAG 4370 AECTP 230, Leaflet 2311	MIL-HDBK-310	Def Stan 00-35 Part 4	STANAG 4370 AECTP 230	
33	Parachute Drop	AOP-20	ITOP 7-2-509	AP101A 1102-1		
34	Parachute Drop	AOP-20	TOP 4-2-509	AP101A 1102-1		
35	System Safety		ITOP 5-1-060			
36	Health Hazards		TOP 6-2-507			
37	Health Hazards		TOP 10-2-508	H.S.E. Regulations		
38	Electronic Equipment Hazards		MIL-HDBK-45	Def Stan 00-10		
39	Radiofrequency Health Hazards		TOP 3-2-616		ENV 501661 ENV 50061	DIN VDE-0848. T.1-4
40	Radiation Hazards		TOP 3-2-711			

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 2. REFERENCES.

TABLE I-1. CONT'D

	SHORT TITLE	NATO	US	UK	FR	GE
41	Blast Overpressure		ITOP 4-2-822		Consignes et instructions relatives à l'enregistrement et à l'exploitation des bruits d'armes et des bruits de détonation	Vorschriften und Richtlinien zur Registrierung und Auswertung von Waffen und Detonationsknallen and STANAG 4569 with references.
42	Radiofrequency Health Hazards	STANAG 2345	ANSI/IEEE C95.1-1999			DIN VDE-0848. T.2 STANAG 2345 ANSI/IEEE C95.1-1999
43	Laser Hazards	STANAG 3606	STANAG 3606		STANAG 3606	STANAG 3606 STANAG 3606 DIN EN 60825-1 ZDv 44/510
44	Electromagnetic Compatibility	IEC 61000 4-2	IEC 61000 4-2			IEC 61000 4-2
45	Safety Assessment Report		MIL-STD-882			

Note: It should not be assumed that the various methods are exactly equivalent or that methods other than the NATO documents can be necessarily deemed acceptable by the relevant national authorities. Further advice should be sought from these national authorities before alternates to the NATO methods are used.

ANNEX I. ABBREVIATIONS, REFERENCES, AND RELATED DOCUMENTS.

APPENDIX 3. RELATED DOCUMENTS.

TABLE I-2. RELATED DOCUMENTS

	SHORT TITLE	NATO	US	UK	FR	GE
a	Global Climatic Data	STANAG 4370, AECTP 230, Leaflet 2311	MIL-HDBK-310, AR 70-38		GAM EG-13	
b	Parachute Drop	AOP-20	ITOP 07-2-509, TOP 04-2-509, MIL-SRD-331	AP101A 1102-1		
c	System Safety		ITOP 05-1-060, MIL-STD-882D, MIL-HDBK-764			
d	Health Hazards		TOP 06-2-507, TOP 10-2-508, MIL-STD-882D	H.S.E. Regulations		
e	Electronic Equipment Hazards		MIL-HDBK-454	Def Stan 00-10		
f	Radiofrequency Health Hazards	STANAG 2345	TOP 03-2-616, STANAG 4324, ANSI/IEEE C95.1-1999		ENV 501661, ENV 50061	DIN VDE-0848. T.1-4, DIN VDE-0848. T.2
g	Radiation Hazards		TOP 03-2-711			
h	Blast Overpressure		ITOP 04-2-822, TOP 04-2-831		Consignes et instructions relatives à l'enregistrement et à l'exploitation des bruits d'armes et des bruits de détonation	Vorschriften und Richtlinien zur Registrierung und Auswertung von Waffen und Detonationsknallen
i	Laser Hazards	STANAG 3606	STANAG 3606, MIL-STD-1425A, MIL-HDBK-828A, TB MED 524, AR 40-46			DIN EN 60825-1 ZDv 44/510
j	Electromagnetic Compatibility	IEC 61000 4-2	IEC 61000 4-2			

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ANNEX J. NATO LETTER OF PROMULGATION.

NORTH ATLANTIC TREATY ORGANISATION

NATO STANDARDIZATION AGENCY (NSA)

NATO LETTER OF PROMULGATION

20 October 2011

1. AAS3P-10 (Edition 1) – SAFETY AND SUITABILITY FOR SERVICE ASSESSMENT TESTING FOR SHOULDER LAUNCHED MUNITIONS is a non-classified NATO publication. The Agreement of Nations to use this publication is recorded in STANAG 4629.

2. AAS3P-10 (Edition 1) is effective upon receipt.

Cihangir AKSIT, TUR Civ
Director, NATO Standardization Agency

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Comments, suggestions, or questions on this document should be addressed to Range Infrastructure Division (CSTE-TM), US Army Test and Evaluation Command, 2202 Aberdeen Boulevard, Aberdeen Proving Ground, Maryland 21005-5001; or e-mailed to:

usarmy.apg.atec.mbx.atec-standards@mail.mil

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